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AUGUST 13, 1942

The IRON AGE

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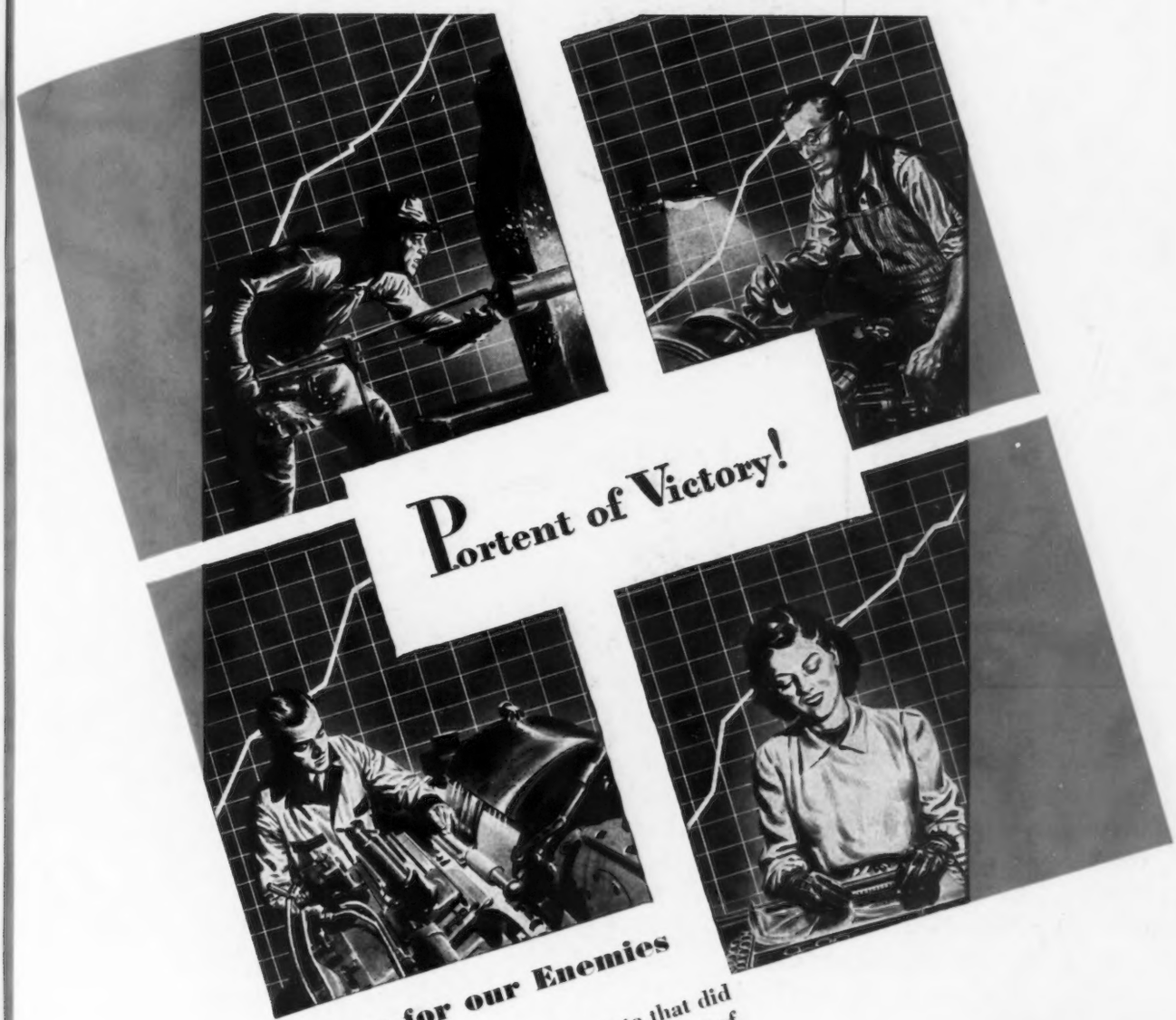

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Production of New Departure ball bearings is at a rate that did not seem humanly possible six months ago. Similarly, output of war material of all kinds is going up and *up* and UP. America answers the challenge to our way of life with production more vast than anything the world has ever known or even dreamed.
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We also make nickel-chromium alloys of the 35-15 and 25-12 types, in the form of castings, and rolled rods and flats. All alloys are melted by high frequency induction which assures close control of composition.

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This Week in . . .

THE IRON AGE

Editorial

Walking the Tightrope 45

Technical Articles

Cast Mortar Shells 47
Cemented Carbide Gun Drills 53
National Emergency Gear Steel 58
Plastic Films for Electron Microscope 64
Silver for Bearings 65
Alloying Elements in Aluminum 69

o o o

Features

Assembly Line 76
Washington 80
West Coast 84
Fatigue Cracks 88
Dear Editor 90

o o o

News and Markets

This Industrial Week 92
News of Industry 95
Personals and Obituaries 145
Non-Ferrous Metals 147
Machine Tool Activity 148
Scrap Markets 150
Iron and Steel Scrap Prices 152
Comparison of Prices 153
Finished Steel Prices 154
Warehouse Prices 158

o o o

Index to Advertisers 221

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Sub Propeller Shafts Needed Quickly!

Story of How Ryerson Ingenuity Saved Five Weeks

URGENTLY needed at a distant shipyard were fourteen forged submarine propeller shafts that must pass Navy specifications.

Forgings were specified, but none could be secured in time.

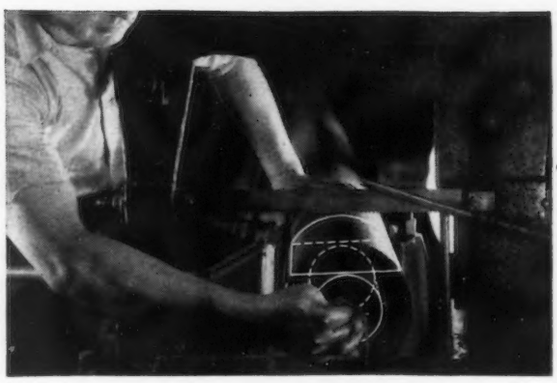
Quickly available in Ryerson stocks were cold rolled bars—the right size—but in five different analyses.

Navy Inspectors were skeptical. Could Ryerson heat-treat and assure uniform physicals—also furnish pull tests for each bar? Well, no; because the piece left after the bars were cut to the needed length, would be too short to make a standard 6″ test sample. A delay of five weeks loomed ahead. . . .

Then Ryerson metallurgists found a way: Inquiry revealed that the shafts were to be machined down at each end for a distance of 7″. So, why not cut a piece from the side of each bar, *before machining*—enough for all tests yet leaving sufficient stock for machining to size? The idea worked perfectly.

The data charts always furnished with Ryerson Certified Steels provided the exact analysis of each bar and assured proper heat-treatment. A few minutes hacksaw work yielded the necessary test samples . . . and all fourteen bars passed the rigid Navy Inspection with flying colors.

Ryerson ingenuity has helped many manufacturers in solving production problems—has also cut ultimate delivery time from months to days. Ryerson engineers and metallurgists, backed by a century of service to the nation, are ready to work with you in accordance with WPB plan in making the most of all available steel.



Cutting 6″ test pieces from side of bar without affecting length.

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RYERSON STEEL-SERVICE

THE IRON AGE

AUGUST 13, 1942

ESTABLISHED 1855

Walking the Tightrope

IN walking a tightrope, it's balance that counts. And it takes lots of practice to attain that. Even the most expert rope navigators have to constantly shift the center of gravity of their long balancing poles to keep from falling down.

When it comes to a problem in balance, the conduct of the affairs of a nation's industries during wartime is infinitely more difficult than learning to be a tightrope expert. Centers of gravity or pressure must be constantly shifted to avoid the wobbles that are popularly known as bottlenecks. No one man has the consummate intelligence, judgment and skill to be able to make these shifts in time to prevent the wobbles and maintain perfect equilibrium. And no collection of men, however able or expert, can be expected to do it. They will become more able as time goes on but the wobbles will still exist, and we can thank God if they remain just wobbles and do not result in tumbles.

Some people seem to think that Germany's industrial war effort runs with clock-like precision and that her industries are walking the production tightrope with the skill of a somnambulist perambulating a tenth story cornice with his eyes shut. You can bet your bottom dollar that there is a lack of balance constantly occurring in Germany too, even though her economic administrators and industrialists have been practicing on the war production tightrope for 10 long years.

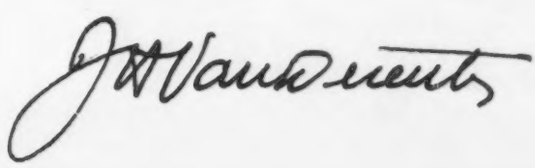
If we had been building up a munitions inventory for 10 years, as Germany has done, shifts in balance between capacity to produce materials, such as steel, and capacity to machine and fabricate them would be cushioned somewhat, and the wobbles would be less noticeable. But against this, and in our favor, is the fact that Germany's industrial reserves have been undergoing depletion while ours have been steadily—and surprisingly—augmenting.

I think it is cause for congratulation, rather than chagrin, that our production plants have performed so marvelously as to go ahead of steel production. It would be much worse, if we had a big surplus of steel over needs for that would mean that we were not turning it into munitions fast enough.

No matter how much steel or munitions we produce, they won't help to win this war until we have ships to carry them abroad. And today more American steel in the form of ships is being sent to Davy Jones locker by German submarines than is going into and coming from our busy shipyards.

That is the real bottleneck that we face and a serious one. And the responsibility for it does not rest upon the shoulders of either the steel producers or the machiners and fabricators.

As long as that hawk haunts the henyard, it is idle to speculate upon the relative priority of the chicken and the egg. Both are vulnerable.



Still More Plants Looking For War Work

Contracts or Subcontracts will throw Additional Men and Machines Into the Fight

If you are looking for metal-working plants to handle war contracts or subcontracts, you will be interested in these summaries of plants with available capacity. They are typical of the many firms that have listed their facilities with Inland in an effort to speed all-out war production.

Write, phone, or wire Inland for the names and addresses of any of the companies listed on this page. We urge that you get in touch with us, even if plants with the manufacturing facilities you require are not listed, and we will gladly forward to you our entire list of those companies seeking war work.

IS-69 Wis. structural steel fabricator, 500 ton cap., plant area 25,000 sq. ft., yard area 26,000 sq. ft., emp. nearly 100. Complete equip. incl. saws, shears, punches, drills, reamers, benders, riveters, column facers, elec. and acetylene welding and cutting equip., blacksmith mach. shop. Experienced in Government prime and subcontract war work.

IS-70 Long established N. Y. mfr. of portable lamps, one story brick bldg., over 60,000 sq. ft., own R.R. siding. Full line stamping presses, grinding and polishing machines. Well equip. plating room, sprayroom with baking facilities. Employing over 100.

IS-71 Largest fabricator in U.S. of sheet metal products No. 8 to No. 30 ga. Two factories (Ill.) with approx. 400,000 sq. ft. mfg. sp.; 2,000 emp. Experience since 1940 in prime and subcontracts. National sales and service organization available. Complete engineering and development staffs. Completely equipped, modern tool rooms for all necessary dies and jigs. Record of dependability on prime and sub-contracts handled to date. "Craftsmen on War Production" on request.

IS-72 Mass. mfr. has machinery and facilities for handling all types of stainless steel welded fabrication up to and including $\frac{3}{16}$" plate. Press brake ¼"—12' cap., shears, initial rolls and nibblers with same cap. Mach. shop includes: engine and turret lathes; boring machine—Gisholt 18" chuck 2" spindle; Bullard vertical turret lathe—32" swing; 9 drills—3 bench, No. 2—3 & 4 spindle, No. 3—1 & 3 spindle, No. 4—1 spindle, 5' American Radial; 3 planers and shapers—1 18" x 18" x 6' bed, W & P 30" x 30" x 14' bed, Cinn. 16" crank shaper; hack saw; band saws; 1 Cinn. Model 101 cut-off wheel; 1½" cap. bolt threading mach.; 1 Baker key slotter; 1 rivet spinner—½" dia.; 1—150 ton hyd. wheel press—18'; sheet and plate shop includes 16 ga. 8' leaf brake; ¼" x 12' press brake; 4" x 4' bending roll; 1—10" x 12' initial type bending rolls; 1—¼" x 10' sq. shear; 1—¼" No. 6 nibbler 42" throat; 1—⅝" single end punch 36" throat; 9 welding generator sets; and 2 acetylene torches.

IS-73 Ill. heating, ventilating and air conditioning mfr. with complete equip. for stamping and perforating work, desires war contracts. 125 empl., over 50,000 sq. ft. fl. sp. Equip. includes presses from 30 to 500 ton cap.; power brakes up to ¼"—10' cap. Handling perforated material 30 ga. to ¾"; also light, heavy stamping and forming.

IS-74 Steel fabricator (Wis.) with comp. facilities for handling subcontract war work. Equip. includes bar shear, comb. punch and shear, double and single end plate punches 1" cap., alligator shear 1¼" cap., rotary plate shear 10 ga. cap., power sq. shear, 4' and 5' radial drills, upright drills, 14" and 24"—12' to 8' eng. lathes, 16" crank shaper, 30" x 30" x 8' iron planer, No. 5 milling machine, 4 to 12" pipe threading machines, power hack saws 6" to 15", rotary cold saws, riveting machines—50 ton, 2" bolt threading machines, air compressors, pneumatic hammers, air and electric drills, and welders.

IS-75 Wis. oven & equip. mfr. desires war subcontract work. Equip. incl.: Stanley Code shown in (), boring mill (ACA), drill presses (BGG, BHH, BOA, BOE) Radial drill (BSK) engine lathes (CBH, CBI, CBJ), turret lathe (CLA), milling machines (DAD, DBC), planer (EAA), keyseater (ICB), gear cutter (JAE), tool grinders (KWD, KXA) buffer & grinder (NBB), hacksaws (PJE, PJF), angle & bar cutter (RBA), cope & punch (RIB) shears (RLA, RVK), unishears (RVP), punches (SBE, SBF), punch press (SBE), angle roller (UAA), brakes (UEG, UIA), welders (XAD, XGC), spot welder (XJC) foundry (YZB) assembly benches (YZM), spray booth & equip. Fl. sp. for assembly, own R.R. siding.

IS-76 Wis. mfr. steel cabinets and vending mach. approx. 50 emp., desires war work sub-contracts. Equip. incl. 3 engine lathes—9", 10" and 18" swing; 4 reclinable punch presses—No. 4—16 & 36 ton cap., No. 5—25 & 36 ton cap.; No. 1½B milling mach.; No. 1—18" surface grinder; 2 shears—16 ga. 36" & 26 ga. 22"; 6'—18 ga. and 21"—26 ga. brakes; shapers; single spindle; bench type and high speed drill presses; tappers; 4 welders; cut saws; riveting mach.; hand drills; sanders; gas drying enamel bake ovens; paint spray tank and booth; degreasing tanks; blacksmith forge and hardening furnace.

IS-77 Sheet steel fabricating plant, (7 to 28 ga.) Ill. 100,000 sq. ft. Arc-gas welding and flame cutting equip. Shears and brakes up to $\frac{3}{16}$", automatic hack saws, plate roller to $\frac{5}{16}$". Complete mach. shop, assembly, woodworking and paint dept. Rail siding, 4 large cranes, 5 to 35 ton. Exp. engr. staff.

IS-78 Wis. steel prod. fab.; 300 ton per mo. cap.; over 30,000 sq. ft. fl. sp.; on R.R. siding; 40 yrs. exp. Specializing in elec. arc welding, cap. 1" thick; tractograph metal flame cutting; metal forming; power rolling and breaking, cap. ⅜" thick; pipe and tube bending; power hammer forge; punching; drilling; riveting; grinding; and cleaning. Complete assembly plate & structural shape work.

IS-79 Wis. steel & wire mfr. angle, flat & tube wire parts; 40 yrs. exp., desires war work, brick const. plt., emergency utility pwr., over 90,000 sq. ft. fl. sp., 350 emp. Equip. incl. 22 punch presses—Marshall & Huschart, Bliss, Wells, Toledo and Consolidated; 10 Wells rivet presses; 10 Wells spring coilers; 9 Wells coil spring knotters; 13 Wells wire straight & cut; arc welders; gang drill; drill presses; Sidney lathe; Cinn. & Milw. shapers; and Racine power hack saw.

IS-80 Wis. mfr. radiators, cooling & heating units, heat transfer equipment, 200,000 sq. ft. fl. sp., emp. over 500. Govt. prime & sub-war work wanted. Three R.R., own siding & trucking service. Comp. metal-working equip. research & experimental labs., tech. experts, draftsmen, engrs., prod. designers. Equip. incl.: lathes; milling mach.; planers; shapers; grinders; punch, drill & arbor presses; tapping mach.; automatic screw mach.; saws; heat treating furnaces; power sq. shears; forming rolls; power brake presses; rotary shears; nibbling mach.; bumping hammers; beading welders and other misc. equip. incl. shears; folders; brakes; slide rolls; crimping mach.; jigs; dry ovens and spray booths.

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Cast Mortar Shells

From Electric Furnace Steel

. . . Another article in the series on shell production. Inherent difficulties in foundry practice have so far limited the casting technique largely to mortar shells which use a relatively small propellant charge compared to long range artillery shells.

o o o

By J. B. NEALEY

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HIGH explosive shell is the normal type used by all mobile artillery and trench mortars. Such shells are designed primarily for two missions, fragmentation or demolition. The explosive charge is usually TNT, although amatol may be used, and they are designed to detonate on contact (sometimes delayed for penetration) or are equipped with time fuses. Fragmentation shells are effective against foot troops and light material targets, such as motor transports, etc. Demolition shells are employed for the destruction of fortifications, emplacements, buildings, etc., because of their blasting and mining effects. Such shells are hollow to receive the explosive charge; the wall dimensions must be held to close tolerances and the physical properties of the steel are held to rigid specifications.

The tonnage of projectiles being hurled in today's battles beggars the imagination. Production regardless of method is a standing order and partially explains the amazing torrent of steel shells pouring from Industrial America into the various theaters of war the world over. Today, high explosive steel shells are being successfully forged, pierced and drawn, spun and cast. One of the most destructive weapons of war in comparison to its size is the light trench mortar carried by foot troops. These weapons are made in two sizes, 60 and 81 mm., and their high explosive shells pack a wallop on the order of the old 75-mm. gun.

One of the largest manufacturers of malleable and steel castings in America, with plants in several parts of the country, undertook to cast high explosive mortar shells. Under the guidance of the Ordnance Department of the U. S. Army, it developed an electric furnace steel and process that are highly successful. One plant of this company has made a million 60-mm. mortar shells in the past few months and is well into the second million.

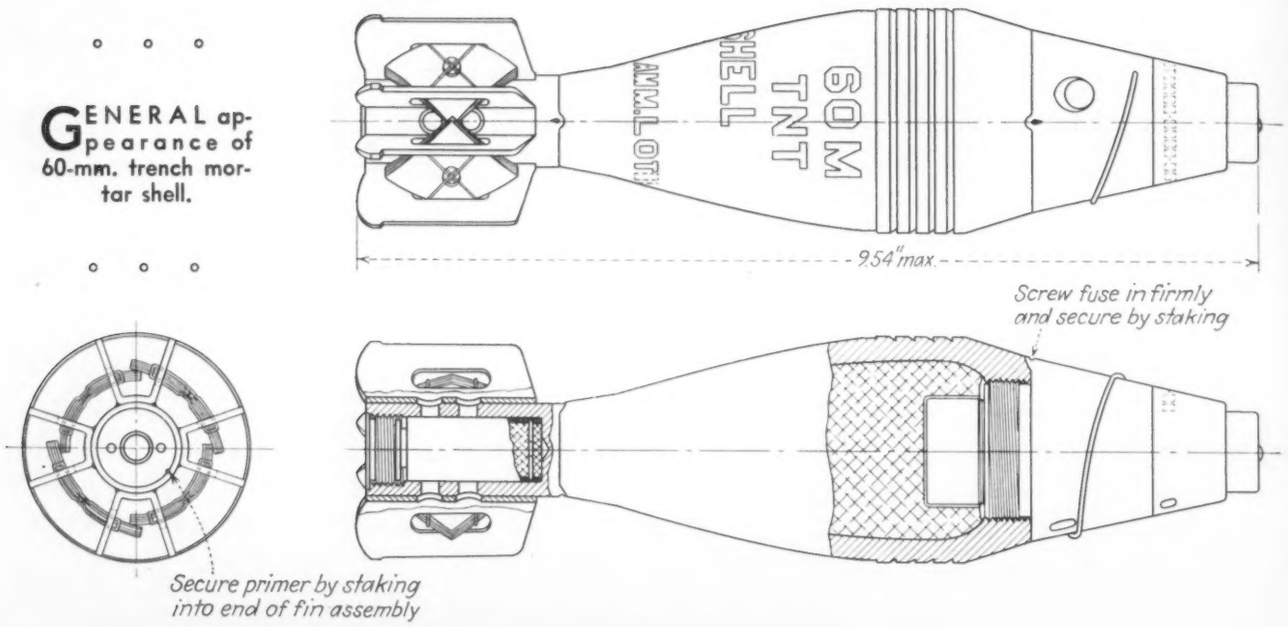
In determining the type of steel to be used, physical characteristics rather than chemical analyses were the guiding factors. The problem was to find a steel that would meet certain fragmentation requirements. Experiments were conducted at one or more of the Ordnance research and manufacturing arsenals to determine the most destructive type of fragmentation. The resulting specifications for the 60-mm. mortar shell called for a steel that, when fragmented by a high explosive, would break up into parts of such an order that 80 per cent of the fragments would remain on a four-mesh screen. Many steels and many heat treatments were tried and discarded. The steel being used at present for cast shells is so heat treated as to produce maximum ductility. This steel has a minimum yield point of 35,000 lb. per sq. in., with an elongation of 30 per cent in 2 in. and a reduction of area of 50 per cent. After machining, the 60-mm. shell must have a volume capacity of 8.7 cu. in. and shell performance today is so closely regulated that a variation of greater than 0.1 cu. in. will not be tolerated.

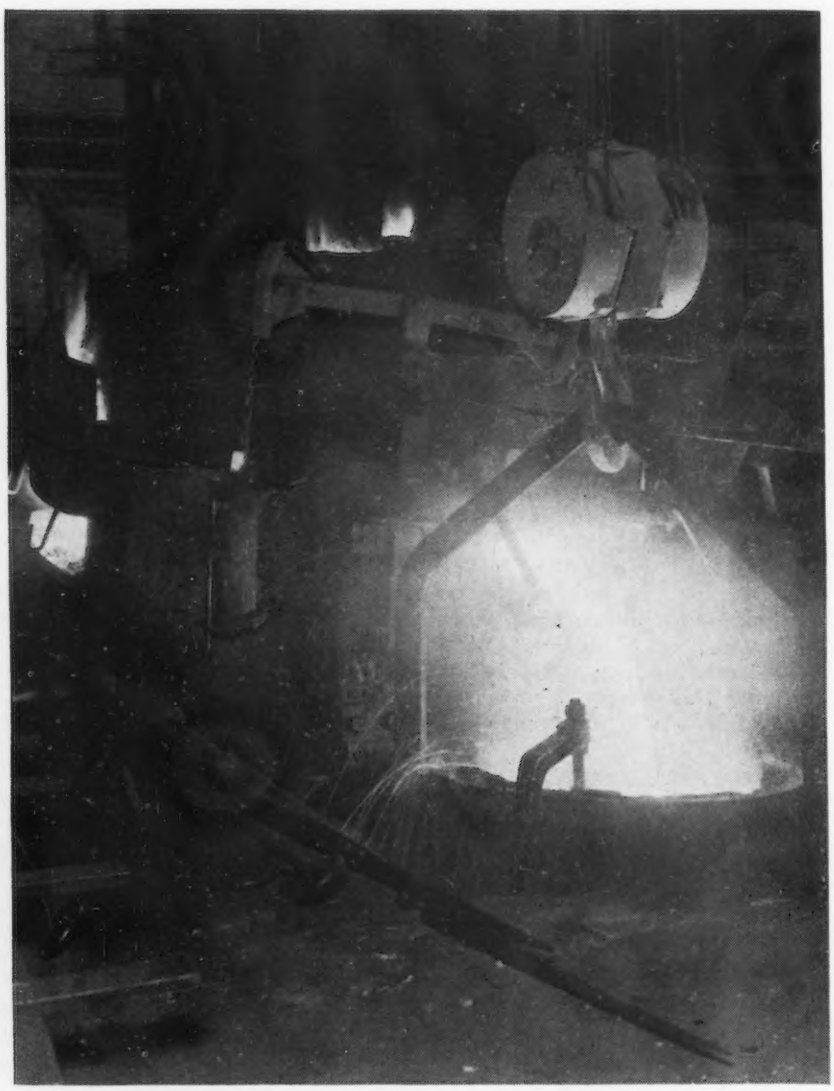
Standard foundry practice, with few variations, is used in casting 60-mm. shells. Production is carried on in a foundry some 850 ft. long by 75 ft. wide, equipped with five motor driven overhead traveling cranes, and innumerable swing post or jib cranes. At one end of this building are located four electric, carbon arc, tilting type steel melting furnaces. These run in capacity from 4000 to 22,000 lb. Two are Heroult furnaces and two Swindell Dressler.

The 22,000-lb. furnace rests on a double section of gear segments which allow it to tilt back and forth. Tilting of the furnace is effected by a hydraulic lifting cylinder. Graphite electrodes of 12-in. diameter extend from a supporting structure down through the roof. Electrodes and roof are elevated and swing to one side for charging. A charging bucket with a segmented bottom is used for placing the scrap charge into the furnace. The furnace is lined with refractory silica brick, and acid melting practice is employed.

The melting of a charge requires a little more than an hour and is divided into three periods. The first is the high voltage period, 195 volts being used to melt a hole in the charge and radiate as much heat into the body of the charge from the sides of this hole as possible. After approximately half an hour, the current is re-

GENERAL appearance of 60-mm. trench mortar shell.





TAPPING an electric furnace heat into a pouring ladle for mortar shells. It requires a little over an hour to melt down the charge from cold scrap. Alloy additions are made in the ladle in the usual way.

duced to 140-160 volts and the melt completed in about another half-hour. At the end of that period the current is again reduced, this time to about 124 volts, and, for something like 10 min., the heat is "worked" and a boil is produced by adding iron ore to the molten metal. The iron ore reacts with the carbon in the melt to form carbon monoxide and other oxides, thereby reducing the carbon content to approximately 0.15 per cent. A sample is then taken and analyzed to obtain the exact carbon content.

The accumulated first slag, which is often too great in volume to permit efficient working, is raked off through the pouring spout and a second slag of sand and lime is added to form a thin, protective covering, and to prevent excess oxidation. The furnace atmosphere is under constant observation and control. Ten minutes after the first test, a second sample is dipped and analyzed for both carbon and manganese. The melt is then brought up to the final specification by adding ferromanganese and silicon of an exact analysis. A pouring temperature of 2950 to 3000 deg. F. is necessary. If below this range, wrinkles form on the inside surface of the shell. If above, the high temperature causes fusion of sand to the casting surface.

A bottom-pour ladle is lowered into the pouring pit after all alloy additions have been made and

the heat ready to tap. During the transfer of molten metal from furnace to ladle, final deoxidizers in the form of aluminum and calcium silicon are added to the metal in the ladle. The ladle, holding 22,000 lb. of molten metal, is now taken to the pouring floor.

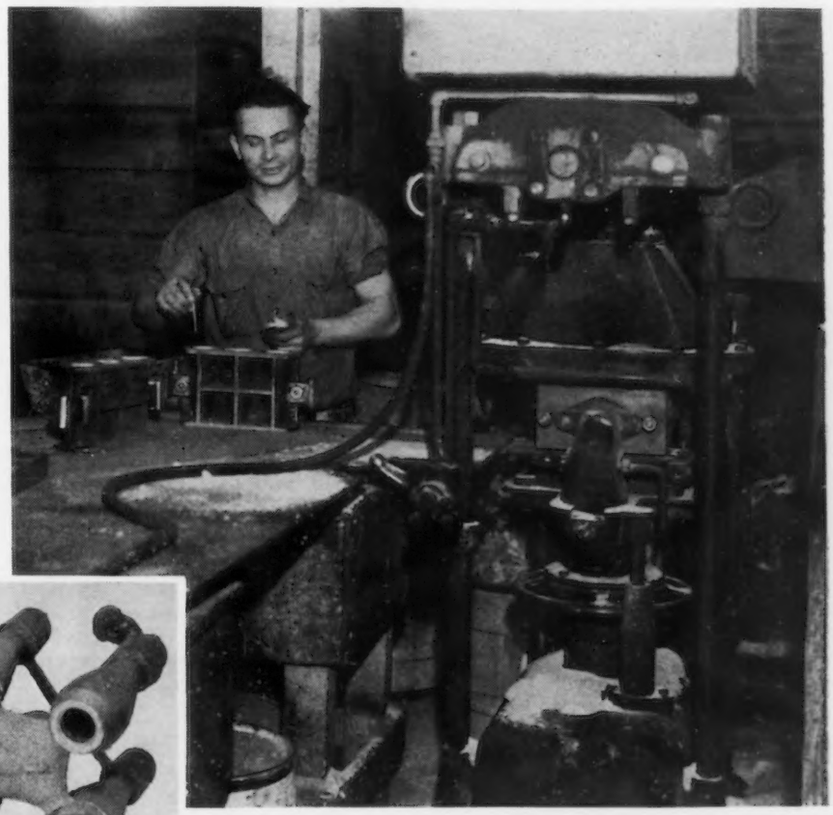
The shells are cast in a three-part mold consisting of the cope, cheek and drag, with steel and brass patterns for each. Sixteen shells are cast to a mold. The drag is molded on jolt, rollover, squeeze Osborn machines and the cheek and cope on jolt, squeeze Milwaukee machines. The cores for the inside of the shell are set in the drag with a pouring gate core in the center. A core setting gage is used to center the cores. The cheek and cope are then added, the mold clamped together and run out onto the molding floor. The cope serves only to house the feeders for the 16 shells.

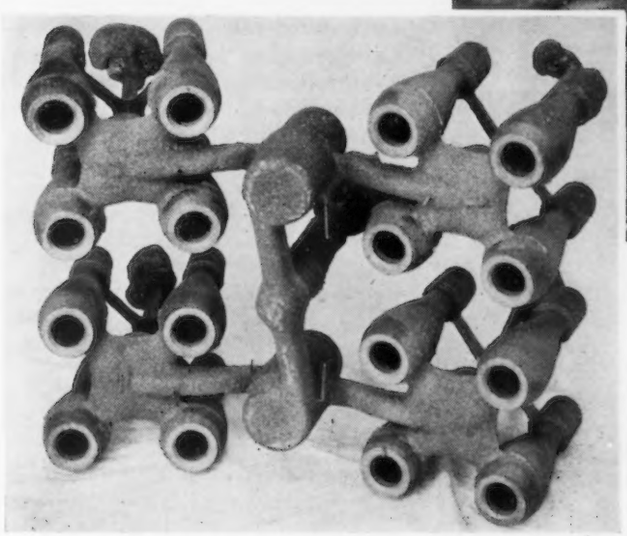
The metal is poured into the sprue and flows into gates which are connected to four feeders, which serve to keep the shell castings solid and free of voids and slag inclusions. There is a vent between each pair of castings for the escape of gases.

Production at this plant is divided into units of two and three molding machines, sand hoppers and pouring conveyors. Each unit has two parallel roller conveyors in front of it. Molds are collected on the nearest conveyor and moved to the second by a transfer car. From here they are moved out onto the pouring floor on a series of parallel roller conveyors some 50 ft. in length. Pouring is directly from the big bottom-pour ladles which are brought from the furnaces by crane. At the further end of the pouring floor is a collecting conveyor consisting of two parallel tracks with short roller frames riding on them. These are pulled along by an endless chain. Molds are placed on these frames and transferred at the shakeout by crane. The freed castings are then sent to the breakoff floor where a man with a hammer knocks the shells off the sprues. The gates are ground off and the feeders removed with a high speed cut-off wheel. Shells are then numbered according to heat, tumbled and heat treated. A unit of three molding machines will turn out between 9000 and 10,000 shells every 24 hrs.

Sand from the shakeout is moved by an apron conveyor first to an overhead storage, then to sand mills for reconditioning and finally to hoppers directly over the molding machines. A cereal and clay binder is used in the molding sand.

Cores are made from new sand to which is added, in the sand mill, core oil or a dry binder and cereal as a green binder. After mixing, core sand is stored in a hopper over a blowing machine. Hinged steel core molds or boxes are placed by hand under this machine which blows them full of core sand. The cores are then placed on trays and dried in an oven of the continuous type. This oven is built on columns and is located 7 or 8 ft. above the floor. Some 50 ft. in length, the oven contains a conveyor consisting of two endless chains carried on sprockets, and between the chains are suspended swinging trays 25 by 92 in. At one end of the oven is an opening through which one end





ABOVE

CORE making set-up. The hinged strip molds are filled with sand in the blowing machining at the right. This view shows the operator placing reinforcing wire in the cores, which are made three at a time.

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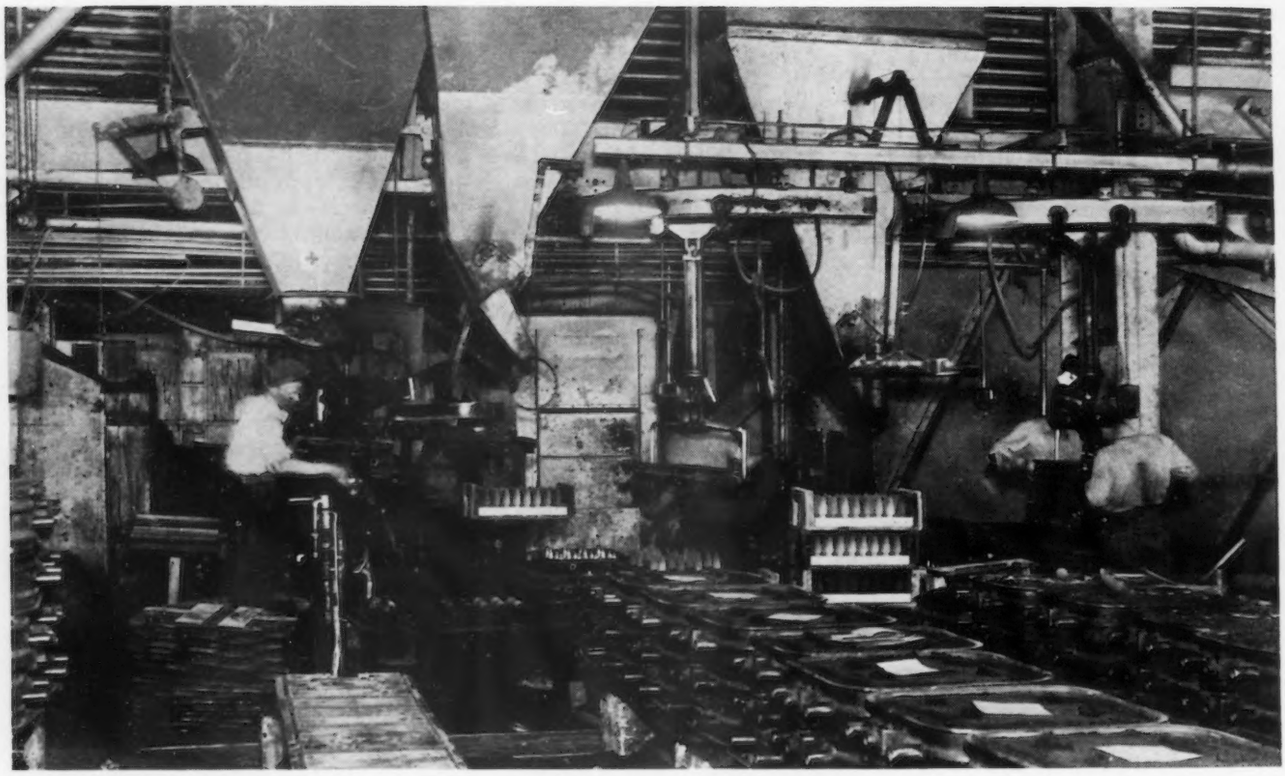
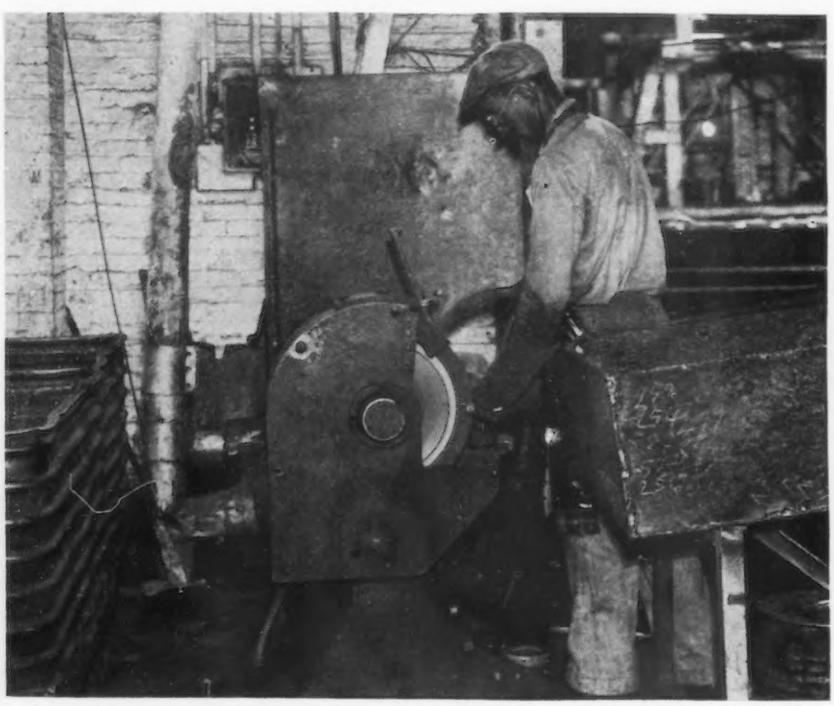
LEFT

SET of 16 60-mm. mortar shell castings as they come from the mold. The shells are cast big end down.



GENERAL view of the molding area showing a battery of jolt squeeze machines with overhead sand hoppers and roller conveyors for the flasks in the foreground. Cores are racked vertically in open side boxes.

of the conveyor extends downward almost to the floor. Men load and unload the cores onto this exposed end of the conveyor. Separate from the oven is a hot-air heater and the heated air is blown into the oven by fans. The heating period and temperature are both controlled automatically. Baking time is approximately one-half hour, and the temperature 450 deg. F.



Gate stubs are ground off by hand on floor stand grinders.

The heat treatment given the shells consists of an operation or cycle known as "triple heat treatment." One furnace some 15 ft. wide and 36 ft. long is used. It is a radiant tube type furnace with a series of gas fired, hairpin shaped radiant tubes located both above and below the hearth. Both ends of the tubes extend through the side of the furnace, a gas burner firing into one open end. The hot products of combustion travel through the tube and are vented through the other end. No burned gases can escape into the heating chamber to dilute a prepared atmosphere which is introduced into the furnace from a separate unit. There are 30 of these tubes, fired by as many burners.

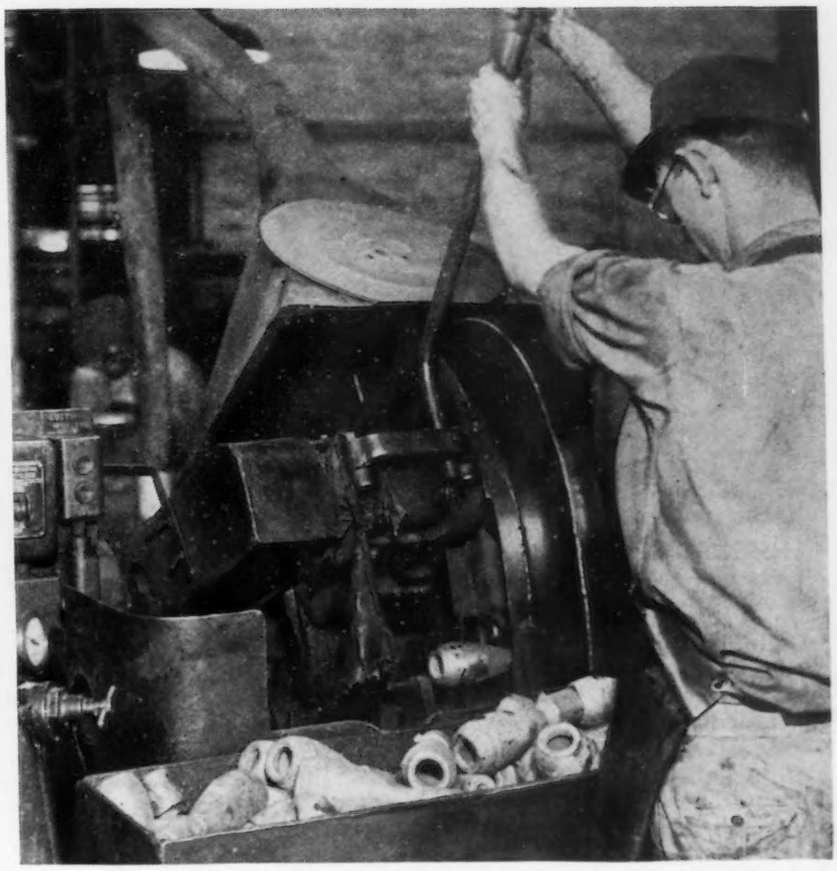
While the same temperature is carried throughout the length of the furnace the burners are manifolded for zone temperature control, and recording pyrometers are used. Extending beyond each end of the furnace is a loading platform of the same dimensions as the heating chamber. The furnace hearth and these platforms are composed of a series of 12 rails mounting small wheels. The entire area of one platform is covered with trays linked togeth-

er to form one solid sheet or floor. The shells are loaded onto these trays and the entire load pulled into the furnace by chains. It is pulled out at the other end when the heating period has elapsed.

The purpose of the heat treating cycle is to break up the "as cast" crystalline grain structure and produce a structure with a maximum amount of ferrite so as to give the ductility specified.

The shells are then tumbled, shot blasted inside and the nose pressed in a hydraulic press, so the machining chuck can have a smooth surface to grip. In the top of the housing of the shot blasting machine is a rail in the form of a circle. Suspended from this is a series of frames, each consisting of three parts which hold a small steel plate. In this plate is a hole slightly smaller than the big end of the shell. An operator loads these fixtures with shells and the whole is indexed intermittently about the circle. At one point in their travel, each shell passes over six sand blast nozzles. The first cleans the upper part of the inside and the others progressively clean various portions until the bottom is reached.

For inspecting the shells, a table is provided with a centering post, the end of which is exactly contoured to fit the closed inside end of a perfect shell. A shell cast with the core out of alinement is immediately revealed by a gage arm on another post when



RISERS at the base of the shells are removed with a high-speed cut-off wheel, as shown.

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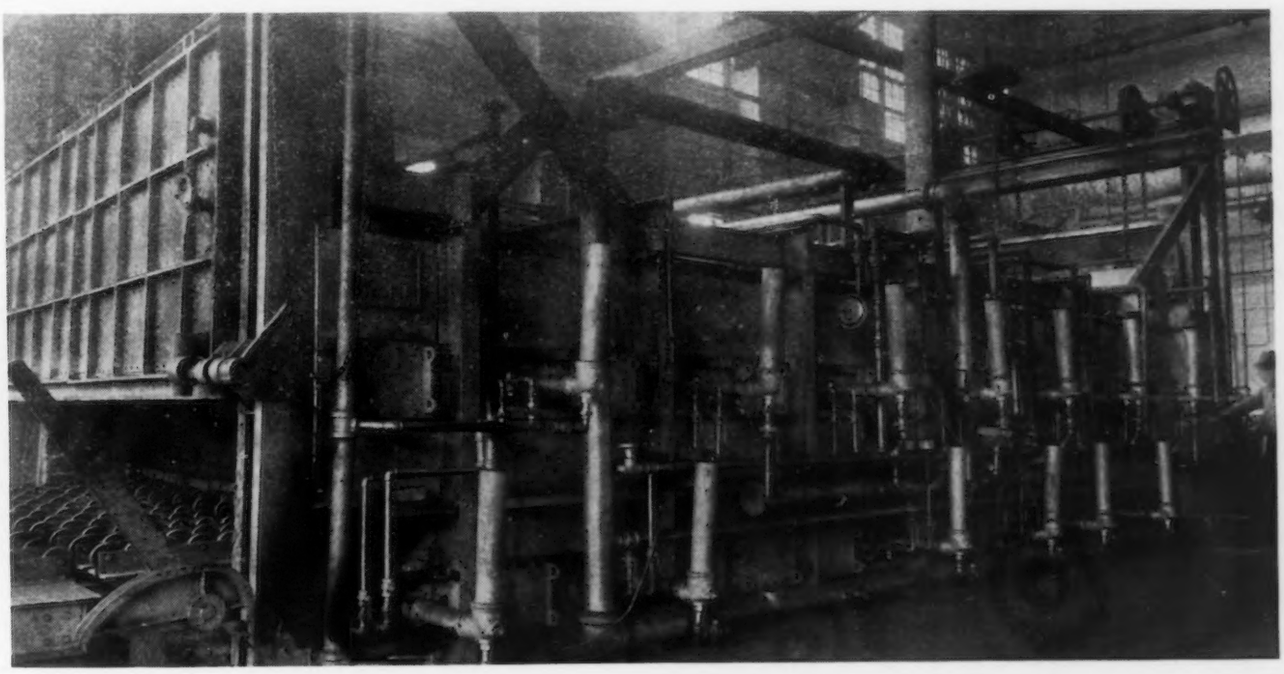
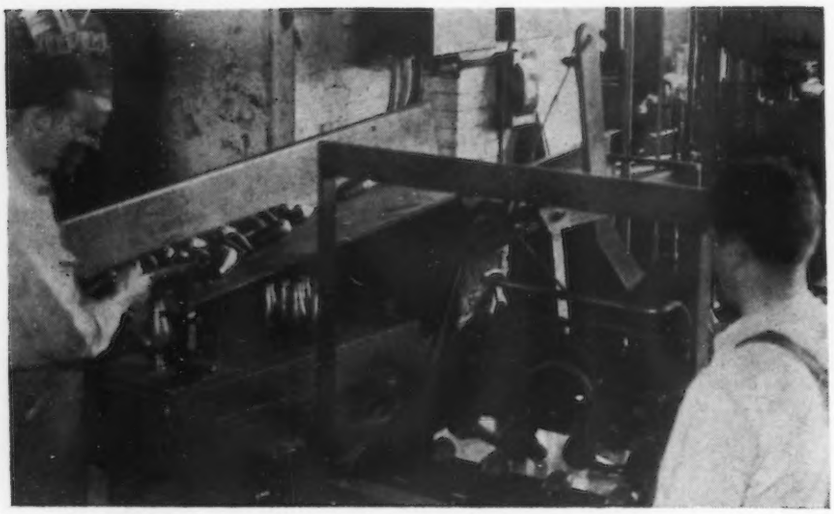
GAS fired radiant tube furnace for heat treatment of cast steel mortar shells. Work is stacked five or six rows deep on the trays which are pulled through the furnace by chains over the roller conveyor hearth.





INSPECTION of shells. Man at left is checking shells for concentricity of cavity in relation to outside contour, while man at right is testing shells for porosity in a pneumatic testing fixture.

the shell is rotated. The shells are then tested for porosity by placing them in a fixture which clamps four at a time through rubber cups and introduces air under 150 lb. pressure. The clamping fixture is then submerged in water to detect air leaks through the castings.

While it is estimated that approximately half the high explosive shells are made by the pierce and draw method and close to 40 per cent are forged by the upsetter process, casting offers distinct possibilities. There is little choice as between the pierce and draw and upsetter methods but considerable economy in time, labor and material by casting are indicated. As stated in this article, a single casting unit of three molding machines and auxiliary equipment will turn out between 9000 and 10,000 shells per day (24 hr.). A pierce and draw installation the writer recently saw consisted of two presses and one draw bench served with a large rotary furnace. This unit was turning out 105-mm. shells at a rate close to 4000 per day—possibly 4200. An installation including two upsetters and furnace would hardly duplicate this performance.

While the above comparisons are interesting, there are other factors of more importance right now. The trench mortar is a light, short range weapon employing a comparatively small charge of gunpowder as a propellant. The stresses brought to bear on its projectile are of a lower order than those to which long range artillery shells are subjected. Hence, porosity of an order not detectable by factory inspection methods might prove dangerous when the shell is subjected to the greater stresses produced within the barrel of a long range cannon. For this reason and the further fact that a superior casting technique must be employed, few artillery shells are being produced by casting at this time.

Influence of Tin In Alloy Steels

A SURVEY of the influence of tin on some of the alloy steels most commonly used was made by G. R. Bolsover and S. Barraclough, and reported to the Iron and Steel Institute, London. The steels selected were manganese-molybdenum, 3.5 per cent nickel, and 3 per cent nickel-chromium qualities as representative steels for oil-hardening and tempering and a 0.35 per cent carbon steel with no alloys as a basis for comparison. Also, a 4.25 per cent nickel-chromium, case-hardening steel was examined. Series of these types of steels were prepared in a 35 kva. high-frequency Ajax-Northrup spark-gap furnace of 18 lb. capacity, producing ingots of about 2 in. square section, which were forged into ⅞-in. round bars for heat treatment and testing. Each series of steels included a basis steel with a low tin content, the other samples having an addition of 0.1, 0.2, 0.3, 0.4, and 0.5 per cent of tin. Further, the effect of phosphorus was investigated by the inclusion of a limited number of steels aiming at a phosphorus content of about 0.045 per cent, as compared with a percentage of about 0.020 per cent in the main series.

The early results were sufficiently interesting to promote queries regarding the influence of molybdenum, if present, for example, in a steel of the 3 per cent nickel-chromium type, in conjunction with a high tin content. Two series with 0.2 and 0.4 per cent molybdenum, respectively, were produced over a limited range of tin additions. To include a steel of the nitriding type, several steels of the 3 per cent chromium-molybdenum quality were examined in the same manner.

On all hardened and tempered steels examined, the influence of tin at even 0.1 per cent is noticeable on notched-bar impact tests. In the carbon steel basis material, this effect is not so marked in the condition oil-quenched after tempering as it is in the normalized condition. On alloy steels, the effect of tin additions appears to be counteracted appreciably by the addition of molybdenum. Higher phosphorus steels, generally, give lower results than low phosphorus steels, but on the data available, this appears to be more in the nature of a lowering of the impact value owing to the phosphorus content rather than to any increasing effect of tin on the high phosphorus as compared to low phosphorus steels.

The effect of tin on nitriding steels appears to be counterbalanced to some extent by molybdenum additions, but the lowering of the impact value after nitriding in the presence of tin is marked. The 4.25 per cent nickel-chromium case-hardening steel suffers only a slight decrease of impact value up to 0.15 per cent tin, but with higher contents the values fall very seriously.

Results of the experiments on each of the test bars are shown in table form in the paper, and graphs indicate the effects of tin on the impact value of various specimens.

Cemented Carbide Gun Drills

By WALTER R. MEYER
and WILLIAM A. KIMSEY

Engineers, R. K. LeBlond Machine Tool Co., Cincinnati

. . . Experiments on the drilling of 20-mm. gun tubes by use of cemented carbide drills are discussed in this, the first detailed study of this subject. The authors describe the equipment used, speeds, feeds, construction of the drills, grinding the drills, and amount of run-out experienced.

RECENT investigation by the R. K. LeBlond Machine Tool Co., indicated that very little information was available on the subject of drilling gun barrels with cemented carbide drills. The company therefore undertook a series of experiments, reported in this article, to establish the possibilities of drilling with cemented carbide on a conclusive and reliable basis.

These experiments extended over a period of several months, during which time between 60 and 75 barrels were drilled. A complete record was kept of these experiments and all data were tabulated, resulting in the development of some very interesting and definite information. All the experiments were made with 20-mm. Hispano-Suiza standard gun barrels.

The drilling and reaming machine used for these experiments was a modified LeBlond No. 1 gun boring lathe, Fig. 1, in which the barrel is revolved and the drill fed into the work but not rotated. The regular headstock on the machine was replaced by a simple type head, driven by a 5-hp. variable speed motor, so that speeds from 700 to 2100 r.p.m. could be obtained. The machine was also provided with proper recording meters for registering horsepower consumption.

The regular coolant pump on the machine was replaced by a 7½-hp. motor, directly connected to a Vickers pump, V-104D series, giving an oil capacity of 10 gal. at 1000 lb. per sq. in., which was considered ample capacity and pressure for these experiments.

The boring carriage was provided with a thrust and torque measuring device, shown in Fig. 2, for measuring the force required to feed the drill and to determine the torque of the cut. Details of the arrangement of these measuring devices are shown in Fig. 3.

Additional equipment that was

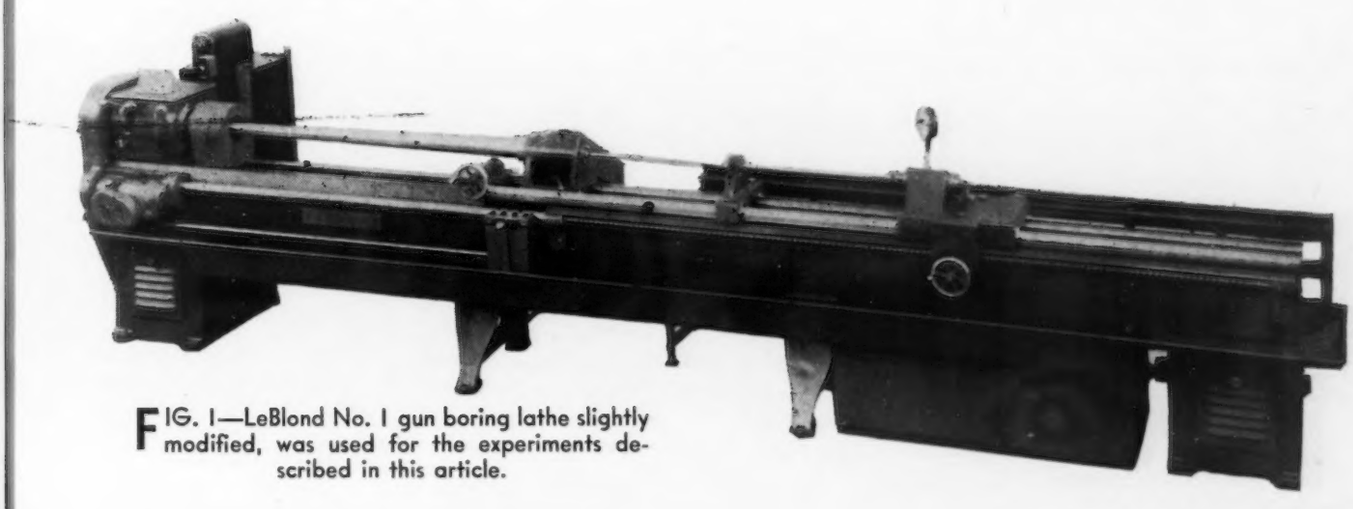


FIG. 1—LeBlond No. 1 gun boring lathe slightly modified, was used for the experiments described in this article.

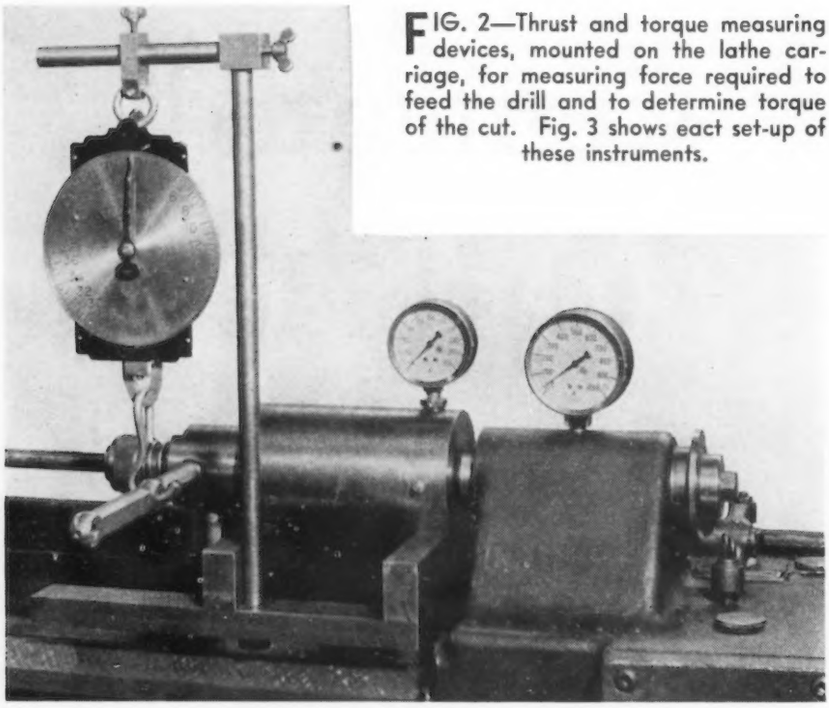
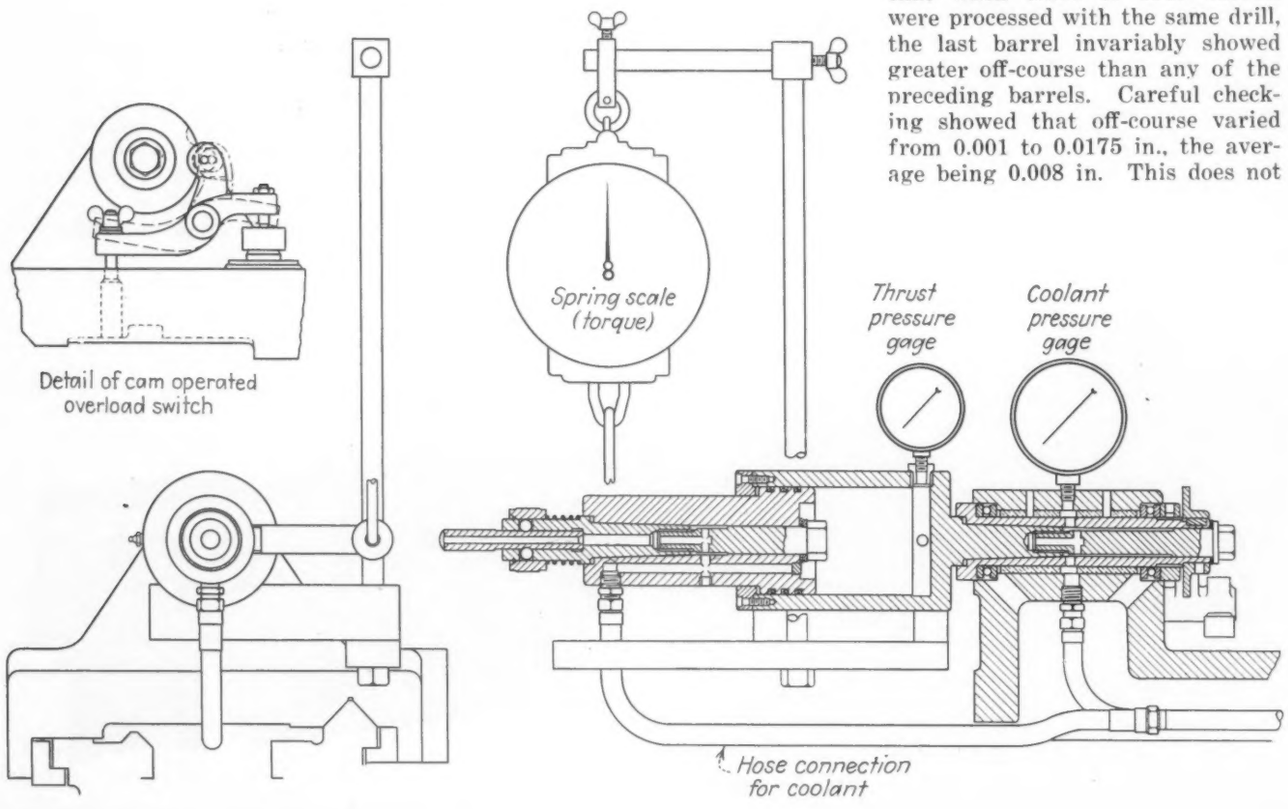


FIG. 2—Thrust and torque measuring devices, mounted on the lathe carriage, for measuring force required to feed the drill and to determine torque of the cut. Fig. 3 shows eact set-up of these instruments.

BELOW

FIG. 3—Details of the experimental set-up used to measure the thrust and torque required to drill 20-mm. gun tubes. The cam operated overload switch is a standard feature on LeBlond gun drilling machines. In operation, the notch in the cam disk is engaged by the roller with a pressure adjusted by the thumb nut. If by reason of dullness of the drill, presence of hard particles in the barrel or breakage of the fine cutting edge at the drill point undue torque is placed on the drill such as to exceed the spring set friction, the lever is immediately kicked out, operating an electric switch in its motion. This switch is hooked up with a plugging relay which immediately stops the main motor and also cuts out the feed, thus preventing damage to the drill.



required was a tell-taling machine for accurately measuring the run-out and straightness of the bore in the barrel, together with wide amplifying boreoscope, plug gages, ring gages, etc.

Forging Preparation Important

Early in the experiments the high importance of properly preparing the barrel for the drilling operation was indicated. The forging must be properly normalized and strains relieved.

The forgings were accurately spot ground in the middle and checked before and after rough turning to measure run-out. After this the forgings were again spot ground and checked before drilling. It was found that the drilling of the hole has little effect on the run-out of the barrel, but the rough turning on the outside of the gun has a very large effect on the run-out of the barrel. It is, therefore, very essential to rough turn the barrel as close to the finishing size as possible.

It was also found that the drill does not always follow the true axis of the run, but sometimes runs "off-course." It should be stated that the initial grinding of the drill assures a straight course of the drill through the work. The variance comes in when the extremely sharp edge of the drill becomes dull. It was found, for example, that when three or four barrels were processed with the same drill, the last barrel invariably showed greater off-course than any of the preceding barrels. Careful checking showed that off-course varied from 0.001 to 0.0175 in., the average being 0.008 in. This does not

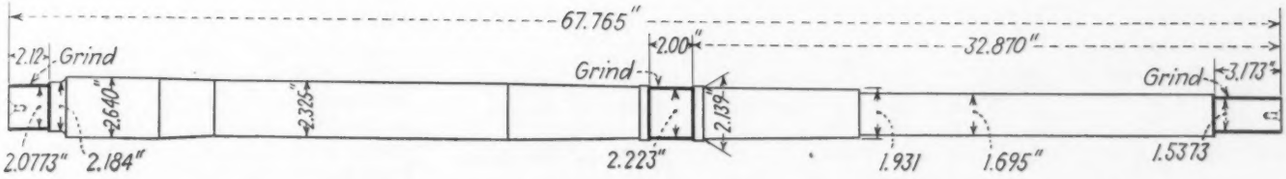


Fig. 4—Principal dimensions of the 20 mm. gun barrel ready for drilling. Spots marked "grind" are used for steadyrests.

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Off-course is compensated for in the following operations by re-centering from the drilled hole, returning the outside diameter concentric with the hole and regrinding the spots for subsequent operations. Since run-out is always greater at the end of the barrel which the drill breaks through, it is necessary to leave more stock at that particular end in the rough turning operation. The weight of metal to be removed in the finish turning operation is less if the drill breaks through the muzzle end because the rough turned diameter is smaller than at the breech end. Actually for finish turning, stock allowance was 0.030 in. on diameter at the breech end, increasing to 0.060 in. on diameter at the muzzle end. Fig. 4 shows the dimensions of the barrel ready for drilling. Barrels were drilled to 0.760 in. diameter, which allowed 0.025 in. for subsequent reaming operations. No straightening was done on any of the barrels.

Eighteen barrels, taken at random, were checked for run-out with the following procedure: The barrels were carefully re-centered from the hole and the ends ground concentric with the hole. The barrel was then located in the tell-tale machine on the previously ground diameters and checked at five different positions along the bore. The table gives the details of this checking showing that results are well within government inspection requirements for straightness.

Drilling the Barrel

After extensive experiments with various types and forms of drill's, the drill shown in Figs. 5 to 11 was selected as giving best results. This drilled a straight hole, gave an excellent finish, best penetration, easy sharpening and simplicity of manufacture. This drill was made in both solid and fabricated types. The fabricated drill was made to save cemented carbide material.

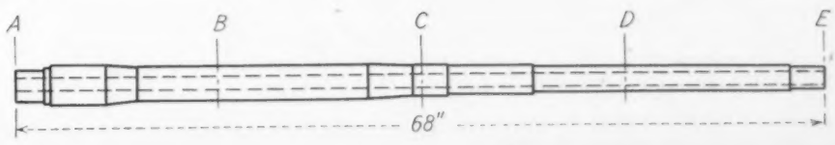
FIG. 5—Fabricated type drill, the second of the two types of drills tested. This type uses less cemented carbide material than the one shown in Fig. 8.

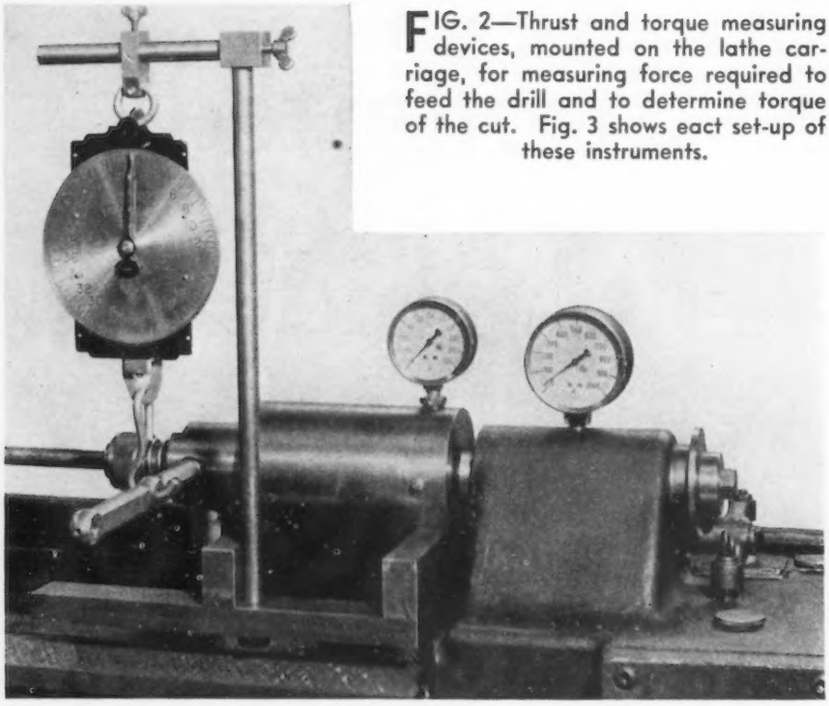
The drill shown in Figs. 6, 7, and 8, was made from a solid piece of molded Carboloy, copper brazed to an improved drill shank. Special fixtures were required to insure absolute concentricity between the drill and the shank.

Slots were ground in the periphery of the drill, as shown in the illustrations and angularly drilled to connect with the hole in the drill shank. This procedure increases the volume of the cutting oil moving to the point of the drill about 200 per cent and, in addition, permits the drill to run on an oil film under pressure. This results in low temperature drilling, higher penetration and longer life to the

Results of Tests on 20-mm. Gun Tubes to Determine Amount of Run Out
(See sketch below for location of positions A, B, C, D and E)

Tube Number	Off-Course of Drill at Muzzle	RUN-OUT OF HOLE AFTER RE-CENTERING				
		A	B	C	D	E
1	0.004	0.000	+0.001	+0.001	+0.005	0.000
2	0.010	0.000	+0.0005	+0.0007	0.000	0.000
3	0.0042	0.000	+0.0007	+0.0015	+0.0005	0.000
4	0.003	0.000	+0.001	+0.0013	+0.001	0.000
5	0.006	0.000	+0.0005	+0.0005	+0.007	0.000
6	0.0085	0.000	+0.0015	+0.0016	+0.0015	0.000
7	0.015	0.000	+0.0025	+0.002	0.000	0.000
8	0.007	0.000	+0.0005	+0.001	+0.0015	0.000
9	0.012	0.000	+0.0013	0.000	−0.0017	0.000
10	0.006	0.000	0.000	+0.0008	+0.001	0.000
11	0.007	0.000	+0.0005	0.000	−0.0005	0.000
12	0.0175	0.000	+0.0015	+0.002	+0.0015	0.000
13	0.003	0.000	+0.0075	+0.001	+0.0013	0.000
14	0.012	0.000	+0.0023	0.000	−0.0015	0.000
15	0.001	0.000	+0.0003	0.000	−0.0003	0.000
16	0.002	0.000	+0.0003	0.000	−0.0002	0.000
17	0.0131	0.000	+0.002	+0.0017	+0.0013	0.000
18	0.0145	0.000	+0.0018	+0.003	+0.0025	0.000





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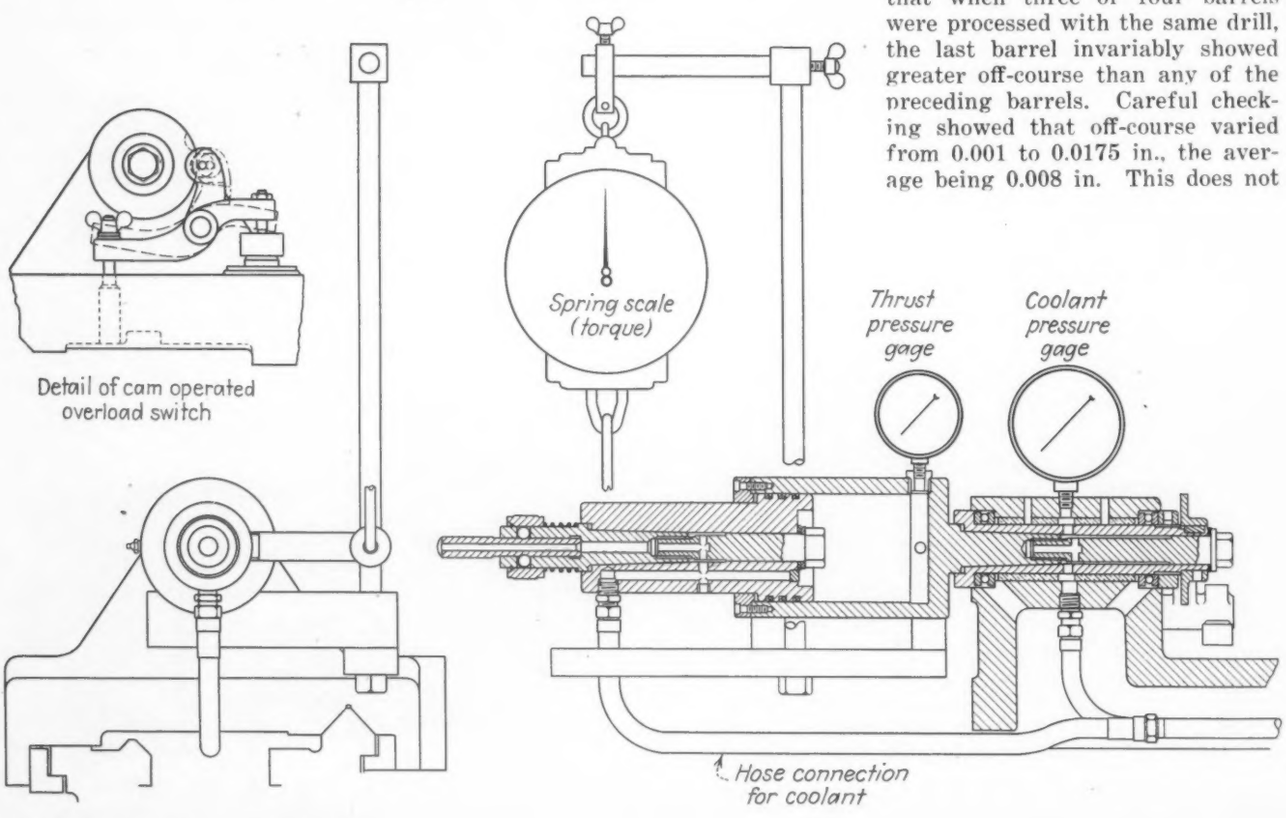

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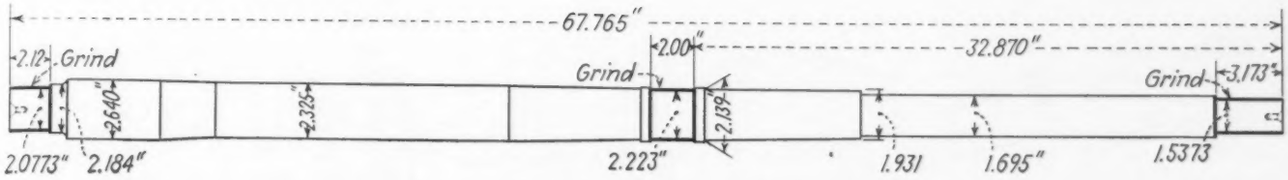

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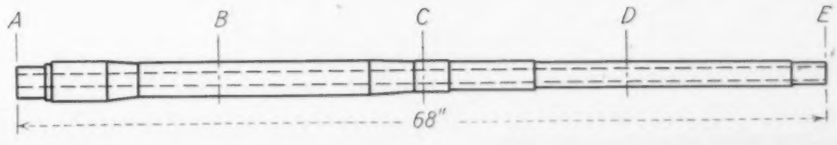
4	0.003	0.000	+0.001	+0.0013	+0.001	0.000
5	0.006	0.000	+0.0005	+0.0005	+0.007	0.000
6	0.0085	0.000	+0.0015	+0.0016	+0.0015	0.000
7	0.015	0.000	+0.0025	+0.002	0.000	0.000
8	0.007	0.000	+0.0005	+0.001	+0.0015	0.000
9	0.012	0.000	+0.0013	0.000	−0.0017	0.000
10	0.006	0.000	0.000	+0.0008	+0.001	0.000
11	0.007	0.000	+0.0005	0.000	−0.0005	0.000
12	0.0175	0.000	+0.0015	+0.002	+0.0015	0.000
13	0.003	0.000	+0.0075	+0.001	+0.0013	0.000
14	0.012	0.000	+0.0023	0.000	−0.0015	0.000
15	0.001	0.000	+0.0003	0.000	−0.0003	0.000
16	0.002	0.000	+0.0003	0.000	−0.0002	0.000
17	0.0131	0.000	+0.002	+0.0017	+0.0013	0.000
18	0.0145	0.000	+0.0018	+0.003	+0.0025	0.000



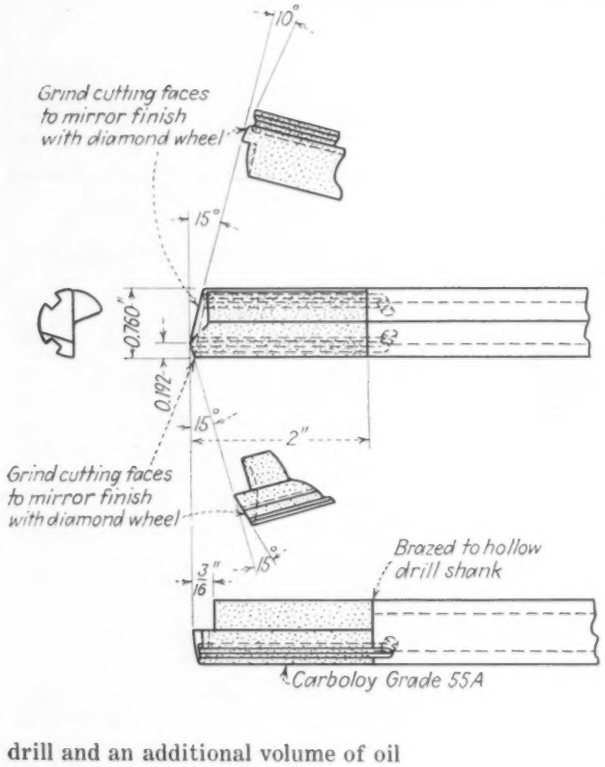


FIG. 6—Details of the angles of the Carboloy drill tip. Fig. 7 is an enlarged view showing contour details.

drill and an additional volume of oil to wash out the chips.

The fabricated drill shown in Figs. 5, 9 and 10 has the same advantages as the solid drill, but requires less cemented carbide to make. An alloy steel shank is used to which Carboloy blade and wear strips are copper brazed in a furnace. In addition to the oil grooves on the periphery of the drill, the body is through drilled to give additional oil supply to the point of the drill. This drill is welded directly to the hollow drill shank by a process combining electric butt and flash welding, with a follow-up anneal.

The carbide material for both types of drills was furnished and fabricated by the Carboloy Co., Inc., to LeBlond drawings. The experiments here showed that grade 55-A Carboloy gave best results. The drill shank on the fabricated drill was made of SAE-1335 material. The improved drill shank was made from heavy-walled high-tensile alloy aircraft tubing, with the tubing first centerless ground before rolling the chip groove. This type of shank has three to four times the torsional strength of the ordinary drill tube, an important factor in carbide drilling. Fig. 11 shows a section of the drill shank. The shank was driven by and connected to the boring carriage by a special drill chuck, for rapidly removing the shank and drill from the machine.

FIG. 8—Drill made from a solid piece of molded Carboloy, brazed to a drill shank. This is one of the two types tested. The other type is shown in Fig. 5.

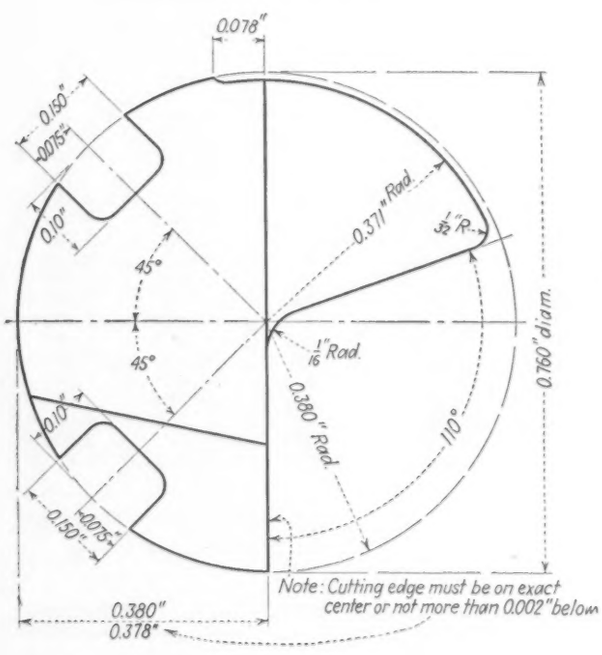


FIG. 7—Enlarged contour detail of drill shown in Figs. 5 and 6.

Drill Grinding

The operation of grinding the drill is very simple. Only three straight cuts are required and can be done on an ordinary cutter grinder. The sharpening consists of removing 0.010 in. from the face of the drill with a diamond wheel. If more than 0.010 in. is to be removed to resharpen the drill, a Norton Crystolon (silicon carbide) cup wheel of 3 x 2¼ x 1¼ x ½ in. hole, Bp. ME-21560 of grade Nos. 3780-17 or 37100-17 was used. The finish resharpening should always be done to a mirror finish by diamond wheel to obtain proper results. This is of extreme importance. The grinding done at LeBlond was with a Norton 4 x 1½ in. flared wheel with ½ in. hole and

diamond resenoid 1/16 in. deep on rim and periphery, Bp. ME-27793, grade No. 400-B-100.

A sulphur base cutting oil, Transultex "A", viscosity 100 with 2 per cent sulphur, was used in these experiments.

The best drilling speed was found to be 1080 r.p.m., giving a cutting speed of 235 ft. per min. at the periphery of the drill. Various rates of feed were tried, from 0.95 to 1.4 in. per min. The feed rate for best results, considering all factors, was found to be 1.07 in. At this rate of feed, which is about 0.001 in. per rev., three barrels were drilled before sharpening the drill, and total floor to floor time was 65 min. per barrel.

It should be mentioned that torques and end thrusts measured on the special dynamometer shown in Figs. 2 and 3 showed wide variations at any given speed or feed conditions. Here again it was found that in the case of a newly sharpened drill and average hardness of material both torque and feeding thrust were low, while as this drill proceeded through more barrels, the torque gradually increased and the feeding pressure likewise increased.

FIG. 11 — Section of a drill shank made from alloy aircraft tubing, with rolled chip groove.

Since this report deals only with the drilling of the barrel, results of experiments on subsequent operations, such as centering, reaming, bore-broaching, and rifle broaching, with Illinois stem broaches, are not included in this summary report.

The authors are indebted to the following for their cooperation and assistance: Carboloy Co., Inc., Detroit, who made the drills; H. R. Krueger Co., Detroit, who developed and made the drill shanks; and Alexander Gabay, of International Harvester Co., whose counsel and advice was of great assistance to us and who has adopted this method of drilling with cemented carbide tips in the production of 20-mm. guns.

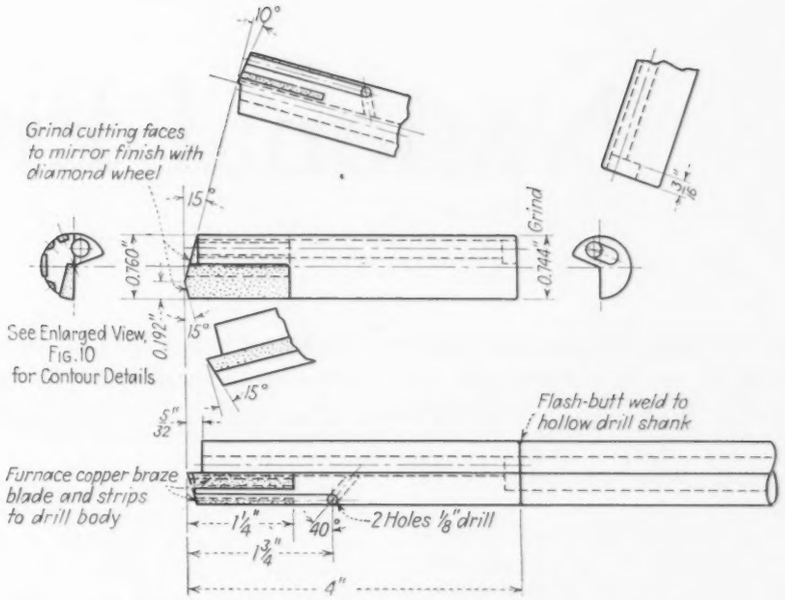


Fig. 9—Details of the fabricated drill shown in Fig. 8.

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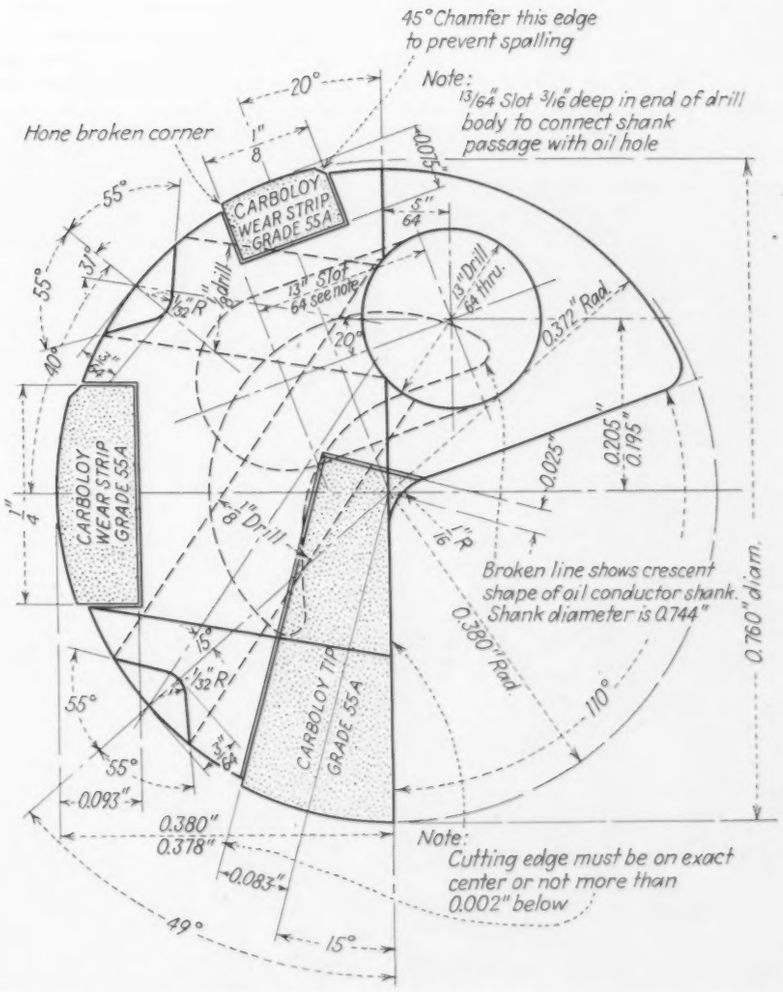

FIG. 10—Enlarged contour detail of the fabricated drill shown in Figs. 9 and 10

National Emergency

IN addition to the National Emergency steels discussed in the first part of this article, appearing in last week's issue of THE IRON AGE, there is another group of steels not classed strictly as National Emergency steels, but which is very valuable because only homeopathic dosages of yet plentiful alloys are employed in their manufacture. This is the 4000 series, formerly known only as the Amola steels.

The 4000 series of steels was first recognized in 1941 by the American Iron and Steel Institute which issued 10 specifications covering this grade, shown in Table III. In the fall of 1941 they were accepted by the Society of Automotive Engineers and appear for the first time in the 1942 SAE Handbook. The SAE, however, lists only eight of these steels, as shown in Table III.

In the earlier list of National Emergency Steels, very little attention was given to the 4000 group. Unofficial sources listed two to four of these steels as belonging to the NE types, thus giving the false impression that only a few of these compositions, such as SAE 4027 and SAE 4037, were obtainable. It is worth noting that any of the 4000 series, from 0.20 to 0.72 carbon, are equally available. In the strictest sense, the 4000 series are not National Emergency Steels but are recognized permanent steel types by the two leading specification writing societies.

From a standpoint of alloy conservation, these steels are more valuable than any of those listed as NE grades because only 0.20 to 0.30 per cent of strategic alloy is employed in their composition, and this alloy, molybdenum, is plentiful. Furthermore, as the manganese content is not above one per cent in any of the types, they are most ideal from the basis of minimum alloy usage. In addition, there is enough service history on them to enable manufacturers of gearing to apply them with a high degree of confidence.

These steels were orginated by the late Harold Wills, in cooperation with the Chrysler metallurgical organization and a committee of steel producers. Through their combined efforts, many early manufacturing difficulties were overcome and practically every steel plant making alloy steels is familiar with the practice of Amola steel manufacture.

For a number of years, Amola steels were used solely by the Chrysler organization and its suppliers of parts. The attitude of other alloy users was apathetic and it was difficult to arouse much interest in the merits of these steels. One reason for this was that many other good alloy steels were readily available. Another factor, and probably the greatest one, was that these steels were not recognized by the Society of Automotive Engineers.

However, the companies supplying Chrysler with parts, such as gears, springs, bolts, and screws, were able to obtain some experience and service history, and Chrysler, over a number of years, extended the use of Amola steels to many important alloy parts such as axles, springs, and transmission and rear axle gears. Those who ignored the Amola types had little or no information on their merits and peculiarities and were reluctant to adopt them even as late as December, 1941. As

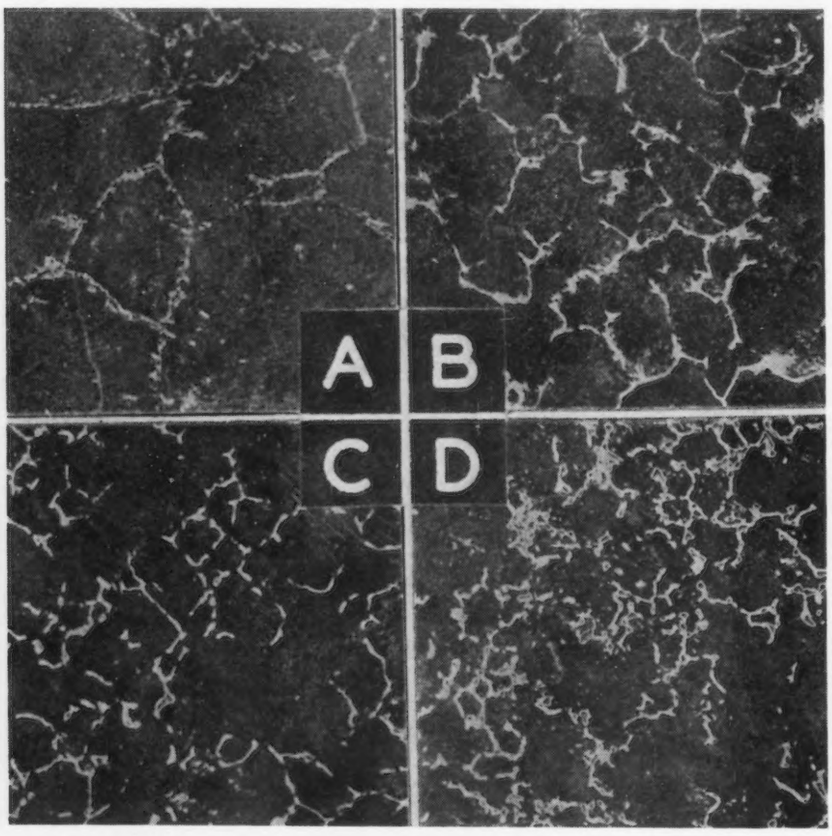

FIG. 2—Border ratings of the Amola, 4000 series, steels, enlarged 500 diameters.

Gear Steels

By E. F. DAVIS
Chief Metallurgist, Warner Gear Division, Borg-Warner Corp., Muncie, Ind.

. . . Use of the Amola or 4000 series steels in the manufacture of gears is discussed herein. The first section of this article last week discussed applications of all the new NE steels.

mentioned earlier, gear makers deprived of nickel steels had adopted successively the chromium, vanadium, and chromium-molybdenum or grainal treated steels, but learning of the scarcity of chromium and vanadium, the 4000 series steels seemed a safe alternate.

To those starting to apply the carburized grades of the 4000 series for the first time, there are some things that must be observed. The grain size must be fine (6 to 8 or finer); the steel must be what is termed abnormal; and an etched sample after carburizing must show broken grain boundaries. The success of the 4000 series has been based upon its abnormal microscopic pattern, and specific chemical requirements are not sufficient. To insure that the correct steel is ordered, it should be specified in accordance to the SAE or Institute grade desired, and, in addition, some notation should be made of the border rating desired or the "Amola Type." The Amola border ratings are shown in Fig. 2. The coarse-grained, normal types are utterly unsuitable for gear purposes.

One of the effects of the abnormality of these steels is that they are shallow hardening and require more carbon than most of the standard alloy steels. It has always been the practice to consider 0.15 to 0.25 carbon as the correct range for steels to be used for carburizing, but when the 4000 series is substituted, it is advisable to increase this range of carbon about 10 points, making carburizing grades of these steels come within the range of 0.25 to 0.35 carbon. It is often difficult to instruct beginners in the use of these steels, as they are inclined to follow normal chemistry for an abnormal steel.

One prominent gear maker specifies SAE 4027, which is 0.25 to 0.30 carbon, for all gears for passenger cars, and SAE 4032, which is 0.30 to 0.35 carbon, for the truck gears. Exploration of hardness of a gear made of SAE 4032 is shown in Fig. 3, and Fig. 4 shows the case and core structure of this steel. In another plant, SAE 4032 is employed for the passenger car gears and SAE 4027 for the truck gears of medium capacity. The reason for this anomaly is that this particular motor car manufacturer purchased his truck transmission and the gear maker supplying these units preferred the lower carbon. As both passenger car and truck units are apparently giving good service and as both firms are large gear manufacturers, it is reasonable to assume that any of the 4000 series of Amola steels within the range of 0.25 to 0.35 per cent carbon is satisfactory for light and medium duty applications. A comparison of the core hardnesses of gears made of the SAE 4027 and SAE 4032 grades is shown in Fig. 5.

It is a good rule, however, to select the carbon content in accord-

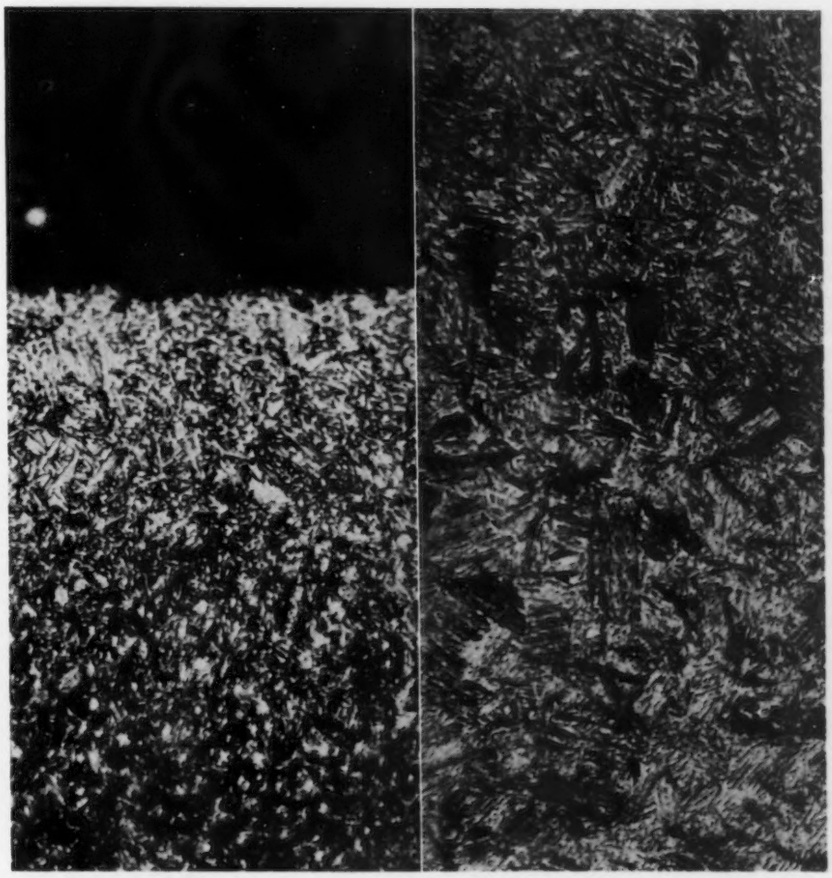

FIG. 3—Case (left) and core (right) areas of an SAE 4032 steel gear, direct quenched after carburizing. Enlargement 100 diameters.

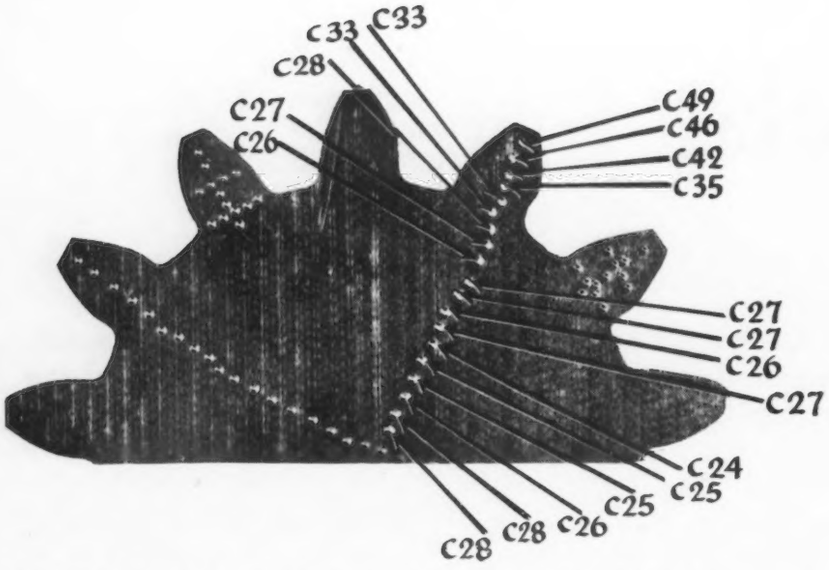

FIG. 4—An exploration of the hardness of an SAE 4032 steel gear, carburized in a gas furnace, direct quenched, and tempered at 355 deg. F. The references are in Rockwell C figures, and enlargement is 1½ diameters.

ance with the mass, keeping in mind that these are shallow hardening steels. If the tooth area alone is considered, the Jominy hardenability is relatively unimportant unless the gears are fine pitched or very coarse pitched. During quenching, gear teeth are affected by cooling on the tops, ends, and both sides, and there is usually ample core hardness to insure sufficient tooth strength. If the teeth are 10 to 12 pitch or even finer, then it is advisable to reduce the carbon content so that there is less chance for brittleness. If the mass is great and the pitch is coarse, such as 2 or 3, it might be advisable to go even higher than 0.35 per cent carbon.

Some companies have found it advisable to improve the depth of hardening by increasing the molybdenum instead of the carbon, but such a procedure puts these out of the standard 4000 series. When deeper hardening is desired, it is probably advisable to select some of the 8000 or NE series.

Dynamometer tests on the SAE 4027 and SAE 4032 gears have been surprisingly good compared to SAE 4620, which was replaced. In most instances, these steels have equaled or surpassed the latter. A series of dynamometer tests in low speed at 75 maximum motor torque gave 21½ hr. without tooth breakage or pitting of gears. Similar tests with SAE 4620 failed to equal this record. As this test was run on ordnance material, actual data can not be published.

The chief engineer of the motor car manufacturer involved in these tests commented as follows after running a series of parallel examinations: "These tests have apparently proved that the general dislike and mistrust of these steels is wrong and that we may be able to obtain better jobs for less cost, using available materials." Another truck manufacturer who made tests on SAE 4032 reported this steel to be equal in dynamometer results to SAE 4620 but not equal to SAE 4815.

However, dynamometer tests are a measure of fatigue values of an assembled unit in which run-out, tooth errors, lack of fillets, stress raisers, deflection, and many other factors contribute to ultimate failure. In addition, failure of bushings, shafts, and thrust washers may be the primary cause of breakage. Neverthless, a poor steel is generally reflected in consistently short runs of a dynamometer test.

Another important property in gear steel is its resistance to impact forces. Gear must not spall or teeth must not fail when clashed into engagement or placed under other unusual adverse operation. Trucks and combat vehicles not only are subjected to all kind of terrain but are employed from the scorching deserts of Libya to the tundra wastes of the far north. American equipment is doing service in Alaska, Russia, and the Orient, and must stand all weather conditions from the heat of 135 deg. F. to temperatures as low as –60 deg. F. This factor has caused considerable resistance because no data of this nature was available for any of the National Emergency steels and very little was on hand of the 4000 series. It is well known that the nickel-bearing steels have almost, without exception, shown excellent service under extreme frigid weather conditions.

Arrangements are being made to test all the NE steels at O, –25, and –65 deg. F. by Charpy and Izod tests. These will be mock carburized specimens heated to 1700 deg. F., quenched in oil, and tempered at 300 deg. F. Also, specimens carburized 0.040-in. will be tested, and will be compared with SAE 4620. Originally no arrangements were made for testing the 4000 series, but this has been revised and the SAE 4027 and SAE 4032 will be included. This work has just been started and it may be several

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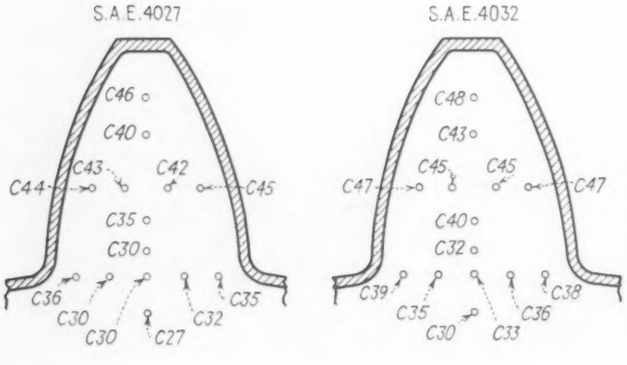

FIG. 5 — Rockwell hardnesses of the cores of typical 6 to 8 pitch gears of SAE 4027 and SAE 4032 steels. Heat treatment of such gears would be gas carburizing 0.040 in. at 1700 deg. F.; quenching direct, and tempering at 355 deg. F. The case hardness on both gears runs between 60 and 62 Rockwell C.

months before these data are available for steel consumers.

Actual service tests are, of course, more valuable than laboratory results because fundamental interest is in whether the gears or other parts will actually break in sub-zero service. This is not possible to obtain for the NE steels at present. Laboratory tests do produce advance facts of comparative value, but do not definitely predetermine whether the part will actually fail.

The situation is a little different with the Amolas or 4000 series because Chrysler, Plymouth, and Dodge cars and trucks have been delivered to practically every part of the United States, Canada, and exported to many countries and climates. Of recent years, most of the gears and other important parts have been of Amola types, and an important service history has been built up on these steels, not available for the NE group.

An example of this is a fleet of passenger cars and trucks from this organization which was delivered to Fairbanks, Alaska, several years ago. This is close to the Arctic circle where winter temperatures may fall to –50 deg. F. It is reported that no complaints have been received of any failures due to extreme cold since the delivery of this equipment. No doubt the abnormality of these steels, plus the fine grain, is an inherent protection against the development of excessive brittleness under sub-zero conditions, such as characterize some of the chromium and high manganese types of steel.

All the NE and 4000 carburizing steel grades should be quenched direct after carburizing. None of these steels are apt to produce case characteristics excessively high in retained austentite by this heat treatment and, being low in alloy content, they really require this kind of a quench to insure high core strength. This is especially true of the 4000 series, which should never be cooled in the box or slowly after carburizing and then hardened by a second heat treatment if it can be avoided. These steels are very sluggish in going into solution, and, when the hardening temperature is low, trouble may be experienced in obtaining an uniform minimum of 58 Rockwell "C" hardness. By direct quenching, difficulty in obtaining hardness and the presence of local soft spots is seldom encountered.

When it is not possible to direct quench, higher hardening temperatures up to 1600 deg. F. are sometimes advisable. Hardness may also be improved by heating the gears in cyanide or even in neutral salt baths. The tempering of direct quenched gears is usually at 345 to 375 deg. F. and most often at 350 deg. F. For reheated gears, the tempering is at temperatures from 275 to 325 deg. F., but most frequently at 300 deg. F.

Furnaces for carburizing NE steels embrace all the various types of equipment always used for this operation from old box furnaces to the latest continuous gas carburizers. One furnace used extensively in the aviation industry but which is also found in various other plants for hardening gearing is the so-called pit or vertical type carburizers using oil, natural gas, and propane as the carburizing medium. The work is placed in canisters and lowered into a circular electric furnace, placed either at floor level or three or four ft. above.

The newest design of gas carburizers operating in the larger gear plants are really complete heat treating units. They not only carburize, but automatically quench, wash, and temper, and some of these are also provided with small furnaces for burning off the trays and fixtures. A furnace of this type is shown in Fig. 6, and the quenching mechanism is shown in Fig. 7.

At the Warner Gear Division of Borg-Warner Corp. these units are provided with four separate rows for work, each independently pushed

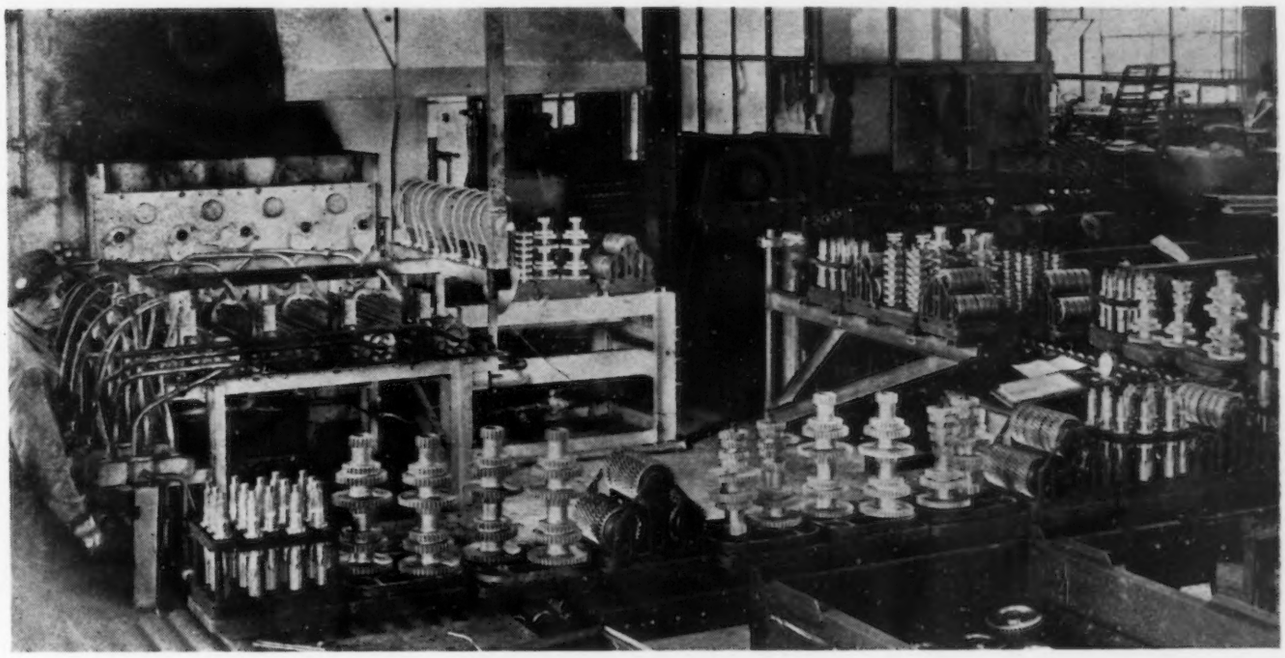

FIG. 6—Four pushers racked with gears and ready for charging laterally into the furnace are shown at the loading end of this automatic gas carburizing furnace. Means of mounting various gears on fixtures can be seen.

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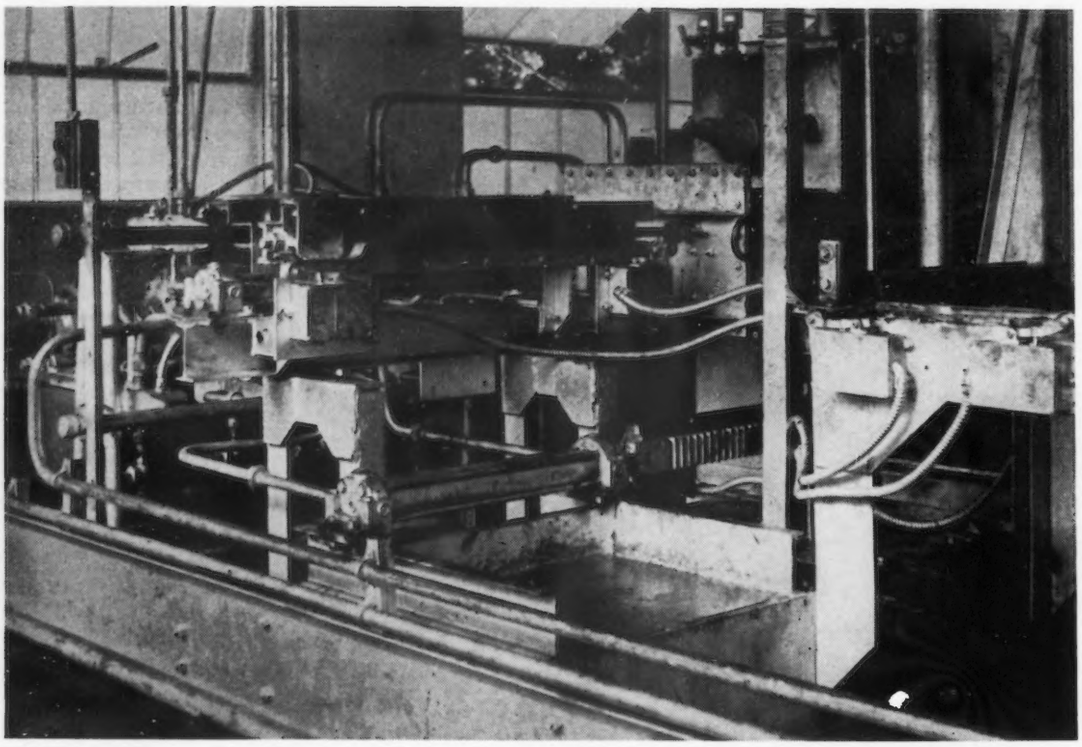


FIG. 7—The quenching mechanism of the automatic gas carburizing furnace shown in Fig. 6.

so that different case depths can be obtained during the same furnace operation. Gears of four different case depths can be produced with the trays going through the furnace simultaneously by merely regulating the time interval. Thus, a 14 min. feed cycle on one row produces a case of 0.030 in., 18 min. for a case depth of 0.040 in., 21 min. for a case depth of 0.050 in.; and 24 min. for 0.060 in. case depth. It is seldom that the furnace is operated in this manner, but operations were on this basis for more than four weeks. Two different case depths is common practice.

These furnaces have no muffles and are heated by radiant tubes, utilizing natural gas for fuel which also is used for carburizing. The absence of muffles increases the useful area of the furnace, thus increasing its productive capacity. Although considerable heat resisting alloy steel is employed for the radiant tubes, their total weight is much less than the weight of a muffle. Tube replacement is easy and often without loss of productive time, whereas a muffle failure often ties up a gas carburizer six weeks or longer.

A recent improvement on this furnace is a new type of gas cracking unit, as shown in Fig. 8. The methane or propane gas is automatically mixed with the correct amount of air and is passed through one or more large tubes heated to about 1850 deg. F. The tubes are filled with nickel-oxide, which serves as a catalyzer and completely decomposes the gas to carbon monoxide and hydrogen so that the gas entering the furnace has a dew point of approximately 0 deg. F. and an hydrocarbon content of about 0.5 per cent. To this gas is added about 10 per cent of natural gas to enrich it and to take care of the oxygen and moisture entering the furnace when doors are opened.

The advantage of all this is that the major cracking of the hydrocarbon is done outside of the furnace except the small amount used for enrichment and over half of this latter amount is decomposed because the effluent gas seldom shows over 4 per cent hydrocarbons. This prevents soot accumulation in the furnace, yielding a clean product. Gears emerge free from carbon deposits and often as white as gears from a cyanide bath. It has been possible under production pressure to operate these furnaces continuously for nearly two months, and the record at the Warner Gear Division is 49 days. Generally however, the time is one month between burn-outs.

Before the installation of this

TABLE III
The "Amola" or 4000 Series of Steels

Numbers		Chemical Composition Limits, Per Cent					
AISI	SAE	Carbon	Manganese	Phosphorus	Sulphur	Silicon	Molybdenum
A 4023	4023	0.20 to 0.25	0.70 to 0.90	0.040	0.040	0.20 to 0.35	0.20 to 0.30
*A 4024	....	0.20 to 0.25	0.70 to 0.90	0.040	0.035 to 0.050	0.20 to 0.35	0.20 to 0.30
A 4027	4027	0.25 to 0.30	0.70 to 0.90	0.040	0.040	0.20 to 0.35	0.20 to 0.30
*A 4028	....	0.25 to 0.30	0.70 to 0.90	0.040	0.035 to 0.050	0.20 to 0.35	0.20 to 0.30
A 4032	4032	0.30 to 0.35	0.70 to 0.90	0.040	0.040	0.20 to 0.35	0.20 to 0.30
A 4037	4037	0.35 to 0.40	0.75 to 1.00	0.040	0.040	0.20 to 0.35	0.20 to 0.30
A 4042	4042	0.40 to 0.45	0.75 to 1.00	0.040	0.040	0.20 to 0.35	0.20 to 0.30
A 4047	4047	0.45 to 0.50	0.75 to 1.00	0.040	0.040	0.20 to 0.35	0.20 to 0.30
A 4063	4063	0.60 to 0.67	0.75 to 1.00	0.040	0.040	0.20 to 0.35	0.20 to 0.30
A 4068	4068	0.64 to 0.72	0.75 to 1.00	0.040	0.040	0.20 to 0.35	0.20 to 0.30

* Specifications A 4024 and A 4028 are resulphurized for improved machinability.

gas cracking unit, furnaces were taken off every week end. Now, the carbon accumulated after 30 days' operation is much less than it formerly was after five days of carburizing. The freedom from heavy carbon deposition has improved the life of alloy rails as well as alloy trays and fixtures. The same is true of the more expensive radiant tubes. Before the cracker was put into operation, alloy rails were replaced on an average of every three months. Now, in one furnace, the same rails have been in operation 16 months, and gas consumption has been reduced 20 per cent.

The muffle type gas carburizer operates much better with this form of cracker. One large gas cracker will provide sufficient gas to serve two or three furnaces and may be piped 500 to 600 ft. if necessary to other units. There are probably more muffle gas carburizers in gear plants than the muffleless types, because the muffleless gas carburizer is a comparatively recent development.

The first continuous gas carburizing unit without a muffle was built for Chevrolet, at Muncie, Ind., by the Continental Engineers of Chicago. This furnace has been in successful operation on gears for about six years. It differs by using large heating cylinders instead of the smaller radiant tubes, and these are placed in the bottom of the heating chamber below the work to be carburized. A cycloidal action of the gas is said to occur. This particular unit provides for cooling the work after carburizing and reheating before quenching, although these operations are automatic.

When Gleason press operations are necessary, such as with ring gears and other gearing where the cross-sections are thin or are of unusual contour, a straight-through type of furnace is used for the carburizing utilizing either pack carburizing methods or gas. In many modern plants utilizing continuous gas furnaces for this operation, chambers and take-out doors at the exit end or side of the furnace have been provided. The trays are pulled out and the gears are placed on Gleason dies or on plugs, depending upon which operations are applied. This is by far the best method for die hardening NE steels, for the parts come out clean and do not require brushing.

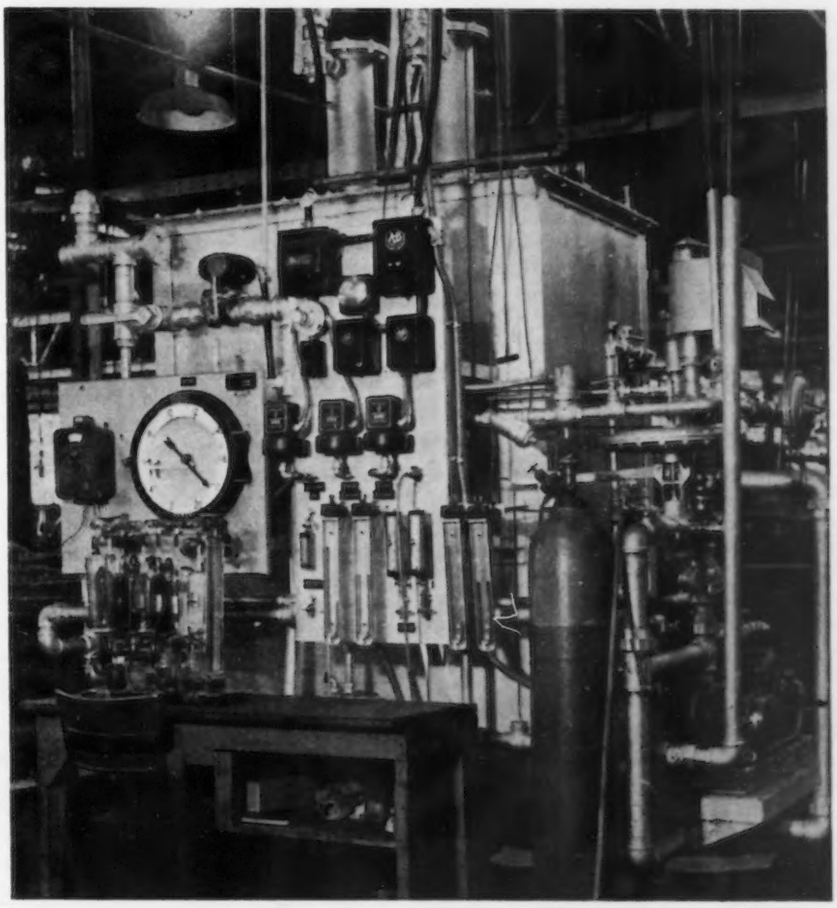
Mention has been made earlier in this article of the present status of the oil-hardening types in reference to their adoption. Oil-hardening SAE 4042 and SAE 4047 grade steels have been used for a number of years for cyanide hardened gears and clutching members. It is advisable to increase the carbon about 10 points on these steels over the carbon used for the steels they replace. Thus, SAE 4047 is satisfactory as a substitute steel for SAE 4140, SAE 4340, SAE 4640, SAE 5140, and similar steels of 0.35 to 0.45 per cent carbon.

There are eight NE steels suitable for numerous types of gearing. The machine tool industry utilizes a large variety of gears which have in the past been SAE 3145, SAE 3240, SAE 4640, and SAE 4340. These gears are frequently furnace hardened and given various tempers, which may be 750 deg. F. or higher. By proper selection, acceptable alternates for the preceding types may be any of the following: NE 8245, NE 8442, NE 8447, NE 8744, and NE 8949.

For coarse pitched teeth and heavy sections where more hardenability is required, those steels highest in carbon, molybdenum, and manganese should be chosen because all three of these are hardening elements, of which carbon is the most potent, molybdenum second, and manganese third. Gears of fine pitched teeth, thin webs, or small sectional area should employ only a minimum of these hardening elements, not only because of increased hardness and brittleness but also there is a tendency to excessive warpage.

One feature in all the 4000 or Amola series causing concern to steel makers, consumers, and those responsible for alloy conservation is the present scrap situation and the high percentage of alloy residuals this group of steel carries. It is not at all uncommon for these steels to obtain as high

FIG. 8—This is the newer type catalyzer for cracking hydrocarbon gases for gas carburizing furnaces. The vertical pipes are filled with nickel oxide, and the gas and air proportioning equipment is shown at right. A micromax recorder shows the operating temperature of the gas cracking unit.



as 0.35 per cent nickel, with chromium up to 0.15 per cent. Steel mills where the major tonnage is low carbon rimming steel but where some alloy steel is made, generally use sufficient plant scrap to keep the alloy residuals low but mills where output is mostly alloy steels carry considerable nickel and chromium because of the alloy scrap employed. In open hearth practice, most of the chromium is oxidized and lost but a large percentage of the nickel and molybdenum is recovered. In electric furnace melting practice it is possible to recover these alloys nearly completely. The following example is given of two different heats of SAE 4027 and SAE 4032 from two different mills, one being essentially a carbon steel mill and the other an alloy mill.

CARBON MILL, Heat No. 11896		ALLOY MILL, Heat No. 45984	
Element	Per Cent	Element	Per Cent
Carbon	0.325	Carbon	0.25
Manganese	0.81	Manganese	0.81
Sulphur	0.026	Sulphur	0.025
Phosphorus	0.015	Phosphorus	0.019
Molybdenum	0.25	Molybdenum	0.25
RESIDUALS		RESIDUALS	
Nickel	0.05	Nickel	0.27
Chromium	0.02	Chromium	0.09

Apparently these residuals, particularly nickel, do no harm, but if chromium is high it may increase depth hardness and increase distortion. This effect does not seem to be marked when the chromium is below 0.10 per cent and residual. There has always been a small amount of these residuals occurring in the 4000 series, but there has been a gradual increase during the past year. Whether this will increase to the point where it will be beneficial or detrimental is difficult to determine. In any case, it is a waste of valuable alloy about which much has been said but not much done. If users of steel could be educated to separate all steel scrap into specific types, then the steel plant would know in advance just what kind of scrap is being purchased. However, the average steel user is more interested in the product than savings, and the cost of segregation makes him more or less indifferent toward separating any but the premium types of scrap material.

In the near future, there will no doubt be an extended application of the NE and 4000 series to aircraft and for purposes where alloy steels containing high percentages of chromium and nickel were previously deemed essential. In fact, the adoption of the 4000 series has already been extensive, much more than is generally realized, indicating that progress has been made at this early date on a conservation program hardly a year old. In nearly all applications, gear makers have been extravagant in the use of alloys but engineers and metallurgists have always preferred a comfortable factor of safety for gears provided by elements such as chromium, nickel, and vanadium. It is also true that no one has fully explored the possibilities of getting the most out of simpler and cheaper steels, and research because of the forced economy will be to the ultimate benefit and profit to industry.

Plastic Films 0.000,002 in. Thick for Electron Microscope

PLASTIC films one five hundred thousandths of an inch in thickness, equal to about a tenth of the length of yellow-orange light waves, have been found best by General Electric scientists for revealing details of metal surfaces under the electron microscope. Such instruments magnify these details as much as 20,000 times, far greater than the useful limit of the ordinary optical microscope. These micrographs have already revealed important knowledge about metals used for war material.

A full account of the technique by which these films are made and used is published in the July issue of the *Journal of Applied Physics*, in an article by Vincent J. Schaefer and Dr. David Harker, of the General Electric research laboratory. They perfected the method which is basically similar to one that Mr. Schaefer used as a hobby to preserve snowflakes and frost patterns.

After the metal sample is polished and etched for a few seconds with acid, it is dipped into a dish containing a solution of Formvar, a plastic, and dioxane, a commercial solvent. The authors point out that it is necessary to do this within a few minutes after the sample has been etched and dried. Otherwise an infinitesimally thin film of grease or other contaminating material may start to form, and this affects the quality of the results.

After dipping in the Formvar solution, the solvent evaporates, leaving the plastic film, which is then stripped off. It reproduces the microscopic hills and valleys of the metallic crystals, and can be placed in the electron microscope for examination.

Mr. Schaefer and Dr. Harker find that the exact thickness of the Formvar film is important, and this can be regulated by the strength of its solution in dioxane. Very thin films, about a millionth of an inch, do not show much contrast in the final electron picture. This seems to be because the film both on top and bottom follows the hills and valleys of the metal. Thus it is all nearly equally transparent to the electron beam. If the film is as thick as 0.000,004 in., contrast is also poor. Then the difference in the film between the hills and valleys is slight and all parts of the film offer nearly the same difficulty to the passage of the electrons which take the place of the light waves in the ordinary microscope.

The best thickness is around 0.000,002 in. These films are just thick enough to make the top of the film level, while the bottom reproduces the hills and valleys. To the neglect of previous experimenters to appreciate these factors, the two G-E scientists attribute the failure of others to obtain satisfactory electron micrographs by films stripped directly from metal specimens.

Silver for Bearings

By ADOLPH BREGMAN
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. . . Silver bearings made by electrodeposition have been found satisfactory for heavy duty applications. The outstanding example is the use of silver-lead-indium bearings in aircraft engines. This article, in two parts, describes the manufacture and use of these bearings.

NO division of mechanical engineering or machine construction is more involved, more difficult to analyze and to break down into its constituents (in other words, to evaluate quantitatively) than the bearing. Volumes have been written; literally hundreds of bearing alloys and designs have been developed; yet still the problem is ever-present. Bearings are, perhaps more than any other machine part, peculiarly subject to a variety of factors whose action in service is difficult and often impossible to predict.

In general, bearings are of two broad types: *heavy* duty and *light* duty; the word "duty" including considerations of load, speed, and temperature. Where light loads, moderate or low speeds, and ordinary room or atmospheric temperatures are involved, the "duty" of the bearings is not severe, and the present-day well-known and long-used materials, such as babbitts, are quite satisfactory for the purpose. Where the "duty" is more difficult, including heavier loads, higher speeds and higher temperatures, these materials are inadequate and machine designers are forced to turn to others.

Regardless of the metal or alloy used, all bearings must be lubricated and must operate under *fluid* film lubrication in which the revolving shaft carries a film of the lubricant to prevent direct contact between the shaft and the bearing. If, for one reason or another, the continuity of the oil film is broken, it becomes a *boundary* film and friction increases, causing a rise in temperature and expansion of the shaft and the bearing, resulting in seizing and failure of the bearing.

For smooth, continuous operation, therefore, the properties that a bearing must possess are:

(1) *Oiliness:* The ability of the bearing material to adsorb certain compounds of the lubricant.

(2) *Embeddability:* The ability of the bearing to soak up grit and thus prevent scoring of the shaft.

(3) *Resistance to corrosion* by oxidized oils.

(4) *High melting point:* To permit operation at elevated temperatures.

(5) *Strength:* To bear up under the weight of the shaft and the parts resting upon it.

(6) *Ease of bonding:* Firm adherence to the backing or support.

(7) *Seizure resistance:* The ability to maintain a continuous fluid film of lubricant to prevent direct contact between the bearing and the shaft.

Table 1[1] lists the properties of the bearing alloys commonly used in connecting rod service. The ratings are given in decreasing order of usefulness: that is, 1 is the most useful or desirable, etc., and they progress up to 5, which is the least desirable. All of these materials are rated according to their performance as lining of steel-backed bearings. From this table it is shown that the most generally satisfactory bearing materials, from an operating standpoint, are silver and silver-lead alloy.

[1] *From "Silver in Industry," edited by L. Addicks.*

An outstanding recent development is the application of the pure silver bearing to connecting rods of airplane engines. These bearings possess the necessary strength and generally the seizure resistance required for the heaviest duty in aircraft service. Occasionally, however, seizure has occurred under light loads in bearings that had previously operated under heavy loads. Laboratory tests[2] disclosed the fact that the property lacking in the pure silver bearing was oiliness. The silver was sufficiently strong to resist fatigue cracking better and to be more serviceable during power dives at higher loads and speeds, without seizure, than any other known material. Other useful properties of silver are its absence of tendency to gall on steel and its comparatively low dry coefficient of friction against steel. Its high thermal conductivity enables it to dissipate local hot spots and its low modulus of elasticity is evidence of its ability for elastic accommodation.

[2] *R. W. Dayton, "The Possibilities of Silver-Rich Alloys as Bearing Materials," Metals and Alloys, September, 1938, pp. 323-328.*

The frictional properties of the silver bearing have been tested in the Amsler wear-tester. In this machine, a steel disk attached to a lower spindle revolves at 420 r.p.m. through a torque dynamometer.

The disk is the shaft of the bearing under test and rotates in a machined notch in the bearing metal specimen, which is firmly attached to a stationary spindle. The bearing can be loaded up to 500 lb. The steel disk and a part of the bearing metal are under a bath of motor oil (SAE 30) with the temperature held at 250 deg. F. It is most important to maintain close control over all of the conditions in this test; the type and surface finish of the steel; the trueness with which it runs; the feed and finish in the notch of the bearing metal and the type of oil.

The test is conducted by: (1) Bringing the assembly up to the test temperature. (2) Increasing the load gradually until the notch of the bearing metal is completely worn in. The coefficient of friction should not exceed 0.20, as galling results from greater friction. (3) Decreasing the load until the bearing is running under fluid film lubrication and the coefficient of friction has dropped to 0.002 or 0.003. (4) Running until equilibrium is reached, and then measuring the coefficient of friction at increasing loads.

At low loads, the coefficient of friction should remain constant at about 0.001 or 0.002, increasing slowly at first, and then rapidly. A series of readings is taken, each reading after equilibrium has been reached at each load, until the coefficient of friction is 0.005, which marks the completion of the test.

The readings are plotted, the pressure calculated which is necessary to give a coefficient friction of 0.005, and this figure is accepted at the seizure pressure of the bearing tested[3].

[3] *A standard method of testing bearings for resistance to fatigue and to "Brinelling," as used by the U. S. Air Corp, may be found in Air Corp Specifications No. 25524-B, Sept. 2, 1935, amended (amendment No. 11) Oct. 27, 1941.*

The resistance to fatigue is rated by a test of the bearing in a standard test pulley, and must withstand 50,000 reversals of rotation at the rate of 120 reversals per min., caused by the motion of a cable passing over the test pulley under various radial loads. The bearings are considered to have failed when cracks or pits make their appearance.

For the Brinell test, the bearings are mounted in an aluminum housing and steel clevis. Specified loads are applied radically, and allowed to remain for five min., after which the bearings are disassembled and examined for any indentation or sign of Brinelling, using 15 power magnification. The presence of any Brinelling is considered evidence of failure. A similar test is also specified for Brinelling resistance in thrust.

The bearings are also inspected manually for end play, radial end play, smoothness of rotation, and tightness.

Another standard test is the use of an apparatus for detecting cracks and porosity, which provide a source of ultra violet light. The test is applied by dipping the bearings in gasoline or some other oil which fluoresces under ultra violet light, wiping them off and then inspecting them for cracks or porosity readily perceptible under the light. In the case of engines which have been run, enough oil is already present, and if the excess is wiped off or washed off with gasoline, the cracks are clearly visible under the light.

Under the test described by Dayton, the seizure resistance value of the silver bearing was calculated at 115 per cent compared with 100 per cent for an alloy consisting of 28 per cent lead, 1 per cent silver, balance copper; and 75 per cent for an alloy of 25 per cent lead, 3 per cent tin, and the balance copper.

The results of a large number of tests made on alloys of silver run against highly polished steel disks showed that all alloying additions tended to reduce the seizure pressure, indicating that extremely pure silver was the most desirable. For example, electro-deposited silver was rated at 165 per cent in relative seizure resistance compared with 140 per cent for double refined silver, remelted, and 80 per cent for double refined silver, deoxidized with 0.15 per cent phosphor-copper. It is noteworthy that additions to improve the seizure resistance of silver by alloying with a number of other elements were unsuccessful.

In the engine tests, however, the

TABLE I
Properties of Bearing Alloys Commonly Used in Connecting Rod Service

Bearing Material	Seizure Resistance	Oiliness	Corrosion Resistance	Strength	Melting Point	Embeddability	Ease of Bonding
Babbitt	3	2	1	4	3	1	1
Cadmium base	3	3	3	3	2	2	2
Copper-lead	2	1	2	2	1	3	3
Pure Silver	1	4	1	1	1	3	4
Silver-lead	1	2	1	1	1	3	5

*The seizure pressures, obtained in test, are rated on the scale of 100 for 121 copper-lead (28 per cent lead, 1 per cent silver, balance copper). Tests made at 250 deg. F. using SAE 30 Mobiloil.
†Polished with No. 4/0 emery, then buffed with rouge.
**Shafts are carburized SAE 2512 steel, hardened to 57 Rockwell C.
††Ground with No. 0 emery.
‡Corrosion-tested specimens were heated for 8 days at 325 deg. F. in an oil to which 1 per cent of oleic acid had been added.
‡‡Brinell hardness was with a 1/8 in. steel ball, 100 kg. load, applied for 30 sec.
§Pounding deformation is the compression of the samples caused by striking a 1/2-in diameter, 1/2-in. long specimen 100 blows with a 7.15 lb. hammer falling 2 in., tested at 300 deg. F.

TABLE II
Properties of Silver-Lead Alloys

Lead Content, Per Cent.	Relative Amsler Seizure Pressure *			Mechanical Properties		
	Polished † Shaft **	Ground †† Shaft				
	Chill Cast	Chill Cast	Corrosion Tested ‡	Brinell ‡‡ Hardness	Shear Strength, Lb. Per Sq. In.	Hot Pounding Resistance, § Per Cent
0.02	120	50	80	24	13,200	12.8
0.98	120	80	105	29	14,600	10.6
1.55	110	85	120	31	15,200	9.0
2.96	110	90	125	34	14,600	8.6
3.68	130	120	140	32	14,400	8.1
4.68	130	120	140	32	14,600	8.0

records made by pure silver were variable. In general, the silver bearings ran at higher loads and speeds than other materials, without seizure. Occasionally it was found that they would seize at comparatively low loads, even after having operated well at very high loads and speeds. These aberrations were attributed to lack of oiliness—the ability of the metal to adsorb parts of the oil and to prevent the shaft-to-bearing contact.

It was pointed out, however, that oiliness is a function of the lubricant, the bearing, and the shaft in common. The oiliness of a bearing may also be judged, therefore, from the Amsler tests, by making comparisons of results with a ground shaft and a polished shaft. A bearing that has good oiliness operates equally well with both shafts; with poor oiliness, the seizure pressure with the ground shaft is substantially lower than with the polished shaft.

From these facts it is indicated that the deficiency in oiliness of pure silver can be remedied to a considerable extent by using it only in connection with a polished shaft. In order to improve the oiliness of the silver bearing, the following steps were suggested:

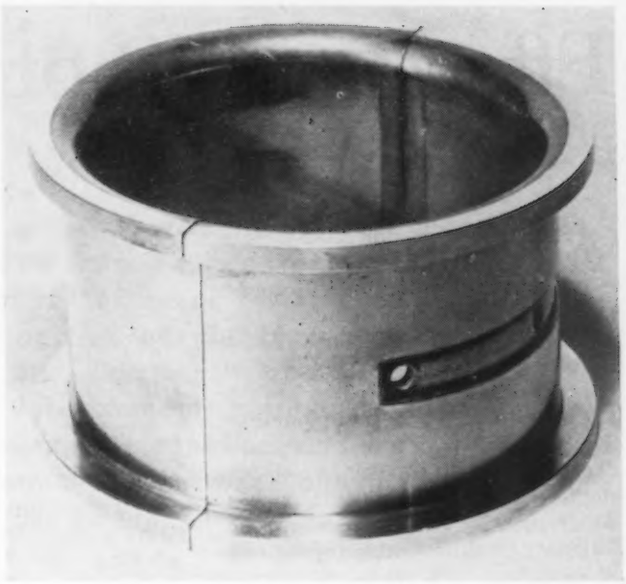
(1) The addition of a small amount of lead to the silver. (2) Blending the oil with an addition agent to wet the surface of the silver; for example, a small amount of sulphur.

Table II shows the improvement in this property effected by various methods[4].

[4] *From, Silver in Industry, edited by Lawrence Addicks.*

An interesting by-product of the seizure studies was the discovery that in all cases the corrosion tests applied to the bearings greatly improved the seizure resistance, even of pure silver. This fact may have important significance in the operation of silver and silver-lead bearings in actual service. Column 4 (Corrosion Tested) in Table II shows this improvement clearly.

Editor's Note: The discussion of the Silver-lead-indium bearing and its characteristics will conclude this article in the next issue of THE IRON AGE.



A SILVER lined bearing for an airplane motor. The heavy silver coating is applied by electroplating and is then machined to the desired thickness.

Wire-Bound Boxes Replace Kegs for Lock Washers

ENGINEERED for the purpose, a new General "All-Bound" box replaces the familiar keg for packing lock washers at the Philadelphia plant of the George K. Garrett Co. A saving in empty container storage space is effected because the All-Bound box is shipped flat, two-thirds assembled. Replacement of 200-lb. kegs with the new containers has reduced weight and initial cost, and cut packing and assembly time.

While the box is being filled from a hopper it is shaken automatically so as to fill it without lost space. After the box is filled it is moved on a roller conveyor to the scale where net weight adjustment is made by adding or removing washers with a hand scoop. After packing, the box is closed and sealed by slipping one wire loop over another and crimping it over with a single motion of the closing tool.

THE new wire bound box, after packing, is sealed by slipping one wire loop over another and crimping with a single motion of the hand tool used by the operator to the right.

Effects of Minor Alloying Elements in

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ALMOST all commercial metals contain metallic and non-metallic elements which, for one reason or another, cannot be removed without great expense. These elements are generally classified as "impurities." It is not always known whether these impurities are harmful or whether they are useful. The lack of such knowledge implies a certain right to call a small quantity of such elements an impurity or undesirable ingredient.

Aluminum and its alloys are no exception to the rule. It is expensive to purify aluminum to a content of 99.90 per cent or higher. The purest commercial aluminum still contains a total of about 0.2 or 0.3 per cent of such elements as iron and silicon, and others such as sodium, titanium, manganese, zinc, and gallium in much smaller amounts. Where aluminum is combined with other commercial metals to form alloys, other "impurity elements" are carried into the alloys. It is often noticeable that copper additions also add a small amount of silver to the resultant aluminum-copper alloy. The addition of silicon introduces iron and may also introduce calcium into the alloy.

Melting the alloys also often leads to absorption of other elements dissolved from the melting vessels and furnace tools. Even under the strictest methods of alloying and melting, additions of other metals occur. The more aluminum is remelted, the greater is the accumulation of so-called metallic impurities. During remelting of scrap metals, the introduction of other elements is often unavoidable. For example, it is impossible to separate mixtures of borings of several aluminum alloys, mixed sheet scrap, or other similar materials. Thus, elements such as copper, zinc, manganese, magnesium, iron, chromium, nickel, silicon, lead, tin, bismuth, titanium, and others find their way into aluminum alloys. If sodium and calcium are added to the list, then there are fourteen common elements in aluminum alloys which may be desired alloying elements, innocuous, or harmful.

Many other metals also accumulate impurities; but in some cases it is possible to remove them by relatively simple operations, either by furnacing, distilling, or electrolytically. Aluminum can be purified electrolytically but the cost is too great to make it commercially practical for aluminum and aluminum alloys.

Since these unwanted minor alloying elements cannot be removed from aluminum, it becomes necessary to use these alloys to the best advantage, especially so under the present existing shortage of aluminum. This is, however, not a new situation for the foundry industry. Remelted aluminum has been successfully used for a long time, and that this material is usable has been demonstrated by the enormous growth of the secondary aluminum industry.

Specifications Limit Use

The full use of remelted aluminum alloys, however, is limited by existing specifications. These specifications were drawn in such a limiting fashion because the complete information on the effect of these elements was not generally known. Before the war there was plenty of pure aluminum available, and the solution of this problem was not so vital. The war, however, has changed the situation. The main trend now seems to be to determine how many and what amounts of these minor elements can be present without affecting the properties of aluminum alloys adversely.

The whole problem resolves itself into the following:

1. What is an "impurity" and when is a minor alloying element an impurity?
2. What effect has this "impurity" on the physical properties?
3. What are the usable limits of this "impurity?"

An attempt was made to answer these questions by an extensive search through the world's leading literature, and surprisingly meager information was found. Many of the articles studied have little value for this purpose because the data were gathered from alloys made chiefly for research purposes and laboratory tested from highly theoretical rather than practical aspects, or on worked material such as sheet, which is not discussed here. When the problem of corrosion resistance is considered, the greatest amount of information available has little direct bearing on the practical use of the alloys, and the investigators usually summarize their work with such broad generalizations that a misleading impression can readily be gained by a hurried reader.

Aluminum alloys are sand cast, chill cast, die cast, or worked by forging, rolling, or drawing. This discussion is limited to the aluminum casting alloys used in the first three methods of fabrication. Furthermore, to obtain a basis for the discussion of the effect of minor alloying elements on aluminum alloys, only the casting alloys specified by the A.S.T.M. will be considered.

Table I represents a comparison of A.S.T.M. alloys as used for sand, permanent mold, and die castings. It is noted that several of the alloys are used for more than one method of casting. Several others are modified slightly to better suit a particular casting process. In this table all alloys are grouped together which are basically the same. In this manner two main groups of alloys can be distinguished: the aluminum-copper alloys and their derivatives, and the silicon alloys and their variations. In the copper

Editor's Note: The numbers in parenthesis in this article refer to the reports and papers included in the author's extensive bibliography, copies of which may be secured from the A.S.T.M.

in Aluminum Casting Alloys . . .

. . . This article, published with the permission and cooperation of the American Society for Testing Materials, discusses the effect of minor alloying elements on the mechanical properties of aluminum-copper, aluminum-copper-silicon, and aluminum-copper-nickel alloys. The author makes a valuable contribution in pointing out that, with the exception of magnesium and iron, which must be carefully controlled, the other alloying elements are either beneficial or innocuous.

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alloy group, 1.5, 4.5, 7.5, and 10 per cent copper alloys are the subdivisions; in the silicon alloy group, the subdivisions are 3, 5, 7.5, and 12 per cent silicon. Table II presents the typical and minimum properties of these alloys as the case may be.

In order to discuss the limits of impurities or minor alloying elements of the above alloys, one must decide the angle of attack. The logical way is to consider the influence of the different minor alloying elements (1) in respect to the physical properties, and (2) in respect to the corrosion properties. The physical properties should be relatively easy to analyze, while the corrosion resistance is very hard to prove or disprove, since no standard tests are available which repeatedly give the same answer; and the few test methods which give information are of value for comparison in theoretical studies of alloys, but are not a reliable guide for actual service requirements.

Furthermore, it is the present practice to use protective coatings, such as anodizing or painting, on aluminum castings that are subjected to corrosion. Although the problem of corrosion is interesting, it is not nearly so important as the physical properties which can be accurately measured, and which give numerical data directly usable for designing of castings, machines, apparatus, and the like. It is, therefore, more important to be well informed regarding the effect of these minor alloying elements on the castability, machinability, tensile strength, yield strength, proportional limit, elongation, impact strength, heat treatability, and stability at elevated, subnormal, and room temperatures.

It should be noted that in the above grouping of properties, castability is listed first. Casting alloys should cast easily in order to be free of defects such as shrinkage-porosity, cracks, and so-called cold shut or welds which are often caused by alloys of low fluidity, and free of dross inclusions which might be caused by readily oxidizing alloying elements. An aluminum alloy which is difficult to cast and from which only occasionally sound castings are obtained will not produce properties comparable to those found in a relatively simple test bar casting from the same alloy. A poor casting, made of a high-strength difficult-to-cast alloy, is less desirable than a sound casting made from a somewhat less strong, but easy-to-cast alloy.

Machinability is next in importance. Castings hard to machine are not desirable for several reasons. Machining cost is high; tool life is low; it might not be possible to obtain a finish which will guarantee good bearing; or, in stressed members, drag marks of the tools will cause notch effects which might lead to weakness of the casting, especially when it is subjected to vibrational stresses.

Group 1: 8 Per Cent Copper Alloy

With these considerations in mind, the discussion of the A.S.T.M. alloys can be opened with the alloys C, CC, 2, and XII, which are all the old 8 per cent copper type, generally known as No. 12 alloy. The original composition was 8 per cent copper and 92 per cent aluminum, the only impurities being a little iron and silicon. This alloy is hard to cast—its fluidity or mold filling ability is not very good, and it is also somewhat hotshort. The addition of more silicon improves the castability of the alloy. It should be noted that the chill-cast specification allows more silicon than the sand-cast specifications because these two mentioned properties—fluidity and hot shortness—need to be well controlled in chill castings (*93*). The two elements copper and silicon are desired as indicated by the range given. The desirable elements in all alloys are indicated by ranges of percentages. All other elements, therefore, are to be considered "impurities."

The most common undesired element in all aluminum alloys, and, of course, also in the above alloys, is *iron*. It originates from the aluminum ore, and is further increased by dissolution of melting vessels and tools. Iron, with aluminum and the other alloying elements, forms complex intermetallic compounds. These compounds have, in general, very low solid solubility in aluminum, and crystallize either in needle and plate form, or in skeleton dendrites (a form known as "chinese script"), or both. These compounds, like most intermetallic compounds, are brittle and reduce the ductility of the aluminum-copper-silicon alloy, the reduction in ductility depending on the amount present and on the size and types of the crystals.

Since the size and form of these crystals depend mainly on the chill obtained during solidification, the alloys which are subject to the most chill during casting can also contain the largest amount of iron. Therefore, the diecast alloy No. XII permits iron up to 2.3 per cent. In permanent mold castings, the same amount of ductility can be obtained with 1.6 per cent iron. However, the specification allows only 1.4 per

TABLE I.—ALUMINUM-COPPER AND ALUMINUM-SILICON ALLOYS.

Group	A.S.T.M. Specifications	Alloy	Cast[d]	Chemical Analysis, per cent											
				Copper	Iron	Silicon	Magnesium	Manganese	Zinc	Nickel	Tin	Chromium	Titanium	Others	Aluminum
1	B 26 – 41 T[a]	C	S	7.0 ± 1.0	1.5	2.0 ± 1.0	0.05	0.3	2.2	....	...	....	....	1.0	remainder
	B 26 – 41 T	CC	S	7.7 + 0.8 − 0.7	1.0 + 0.4 − 0.2	1.25 ± 0.25	0.05	0.3	0.2	....	...	....	....	0.3	remainder
	B 108 – 41 T[b]	2	P	7.0 ± 1.0	1.4	4.0	0.1	0.3	2.5	....	...	....	....	1.0	remainder
	B 85 – 39 T[c]	XII	D	6.0 to 8.0	2.3	3.5	0.1	0.3	1.8	0.5	0.3	....	....	0.3	91.00
2	B 26 – 41 T	F	S	10.0 ± 0.75	1.5	Fe + Si 2.0 max.	0.25 ± 0.1	0.3	0.2	....	...	....	....	0.3	remainder
	B 108 – 41 T	4	P	10.0 ± 0.75	1.5	1.0	0.25 ± 0.1	0.3	0.4	0.3	...	....	....	0.3	remainder
	B 108 – 41 T	5	P	10.0 ± 1.0	1.2	4.0 ± 0.5	0.25 ± 0.1	0.3	0.5	....	...	....	....	0.5	remainder
3	B 26 – 41 T	G	S	4.5 ± 0.5	1.0	1.2	0.03	0.05	0.05	....	...	....	0.2	0.05 each	remainder
	B 26 – 41 T	GG	S	4.5 ± 0.5	1.2	1.2	0.1	0.3	0.2	....	...	....	0.2	0.2	remainder
	B 108 – 41 T	1A	P	4.5 ± 0.5	1.0	2.5 ± 0.5	0.05	0.3	0.2	....	...	....	....	0.3	remainder
	B 108 – 41 T	3	P	4.5 ± 0.5	1.0	5.5 ± 0.5	0.1	0.3	0.5	....	...	....	....	0.5	remainder
4	B 85 – 39 T	VII	D	3.5 to 4.5	2.3	4.5 to 5.5	0.1	0.3	1.0	0.5	0.1	....	....	0.2	91.00
	B 85 – 39 T	IX	D	3.5 to 4.5	1.8	1.0 to 2.5	0.05	0.3	0.8	3.5 to 4.5	0.1	....	....	0.2	90.25
	B 85 – 39 T	VIII	D	1.0 to 2.0	2.0	0.5 to 1.0	0.1	0.3	0.5	1.75 to 2.5	0.1	....	....	0.2	95.50
	B 26 – 41 T	H	S	4.0 ± 0.5	1.0	0.7	1.5 ± 0.3	0.3	0.1	2.0 ± 0.3	...	....	....	0.3	remainder
	B 108 – 41 T	11	P	4.0 ± 0.5	1.0	0.7	1.5 ± 0.3	0.3	0.1	2.0 ± 0.3	...	....	....	0.3	remainder
5	B 26 – 41 T	J	S	0.4	0.8	5.0 + 1.0 − 0.5	0.05	0.3	0.2	....	...	....	0.2	0.3	remainder
	B 26 – 41 T	JJ	S	0.1	0.8	5.0 + 1.0 − 0.5	0.05	0.05	0.05	....	...	....	0.2	0.05 each	remainder
	B 108 – 41 T	9	P	0.4	0.8	5.0 + 1.0 − 0.5	0.05	0.3	0.3	....	...	....	....	0.3	remainder
	B 108 – 41 T	9A	P	0.1	0.8	5.0 + 1.0 − 0.5	0.05	0.05	0.05	....	...	....	....	0.05 each	remainder
	B 85 – 39 T	IV	D	0.6	2.0	4.5 to 6.0	0.1	0.3	0.5	0.5	0.1	....	....	0.2	95.00
6	B 26 – 41 T	K	S	0.15	0.8	12.5 ± 0.5	0.05	0.2	0.1	....	...	....	....	0.2	remainder
	B 108 – 41 T	8	P	0.3	0.8	11.0 ± 1.0	0.05	0.5	0.3	....	...	....	....	0.5	remainder
	B 85 – 39 T	V	D	0.6	2.0	11.0 to 13.0	0.1	0.3	0.5	0.5	0.1	....	....	0.2	88.00
7	B 26 – 41 T	N	S	1.25 ± 0.25	0.5	5.0 ± 0	0.5 ± 0.1	0.1	0.05	....	...	....	0.2	0.2	remainder
	B 85 – 39 T	VI	D	1.5 to 2.5	2.5	2.5 to 3.5	0.1	0.3	0.8	0.5	0.1	....	....	0.2	95.00
	B 85 – 39 T	XI	D	1.0 to 3.0	2.0	7.0 to 9.0	0.1	0.3	0.5	0.5	0.1	....	....	0.2	90.00
	B 26 – 41 T	M	S	0.2	0.5	7.0 ± 0.5	0.3 ± 0.1	....	0.05	....	...	....	0.2	0.05 each	remainder
	B 108 – 41 T	10	P	0.2	0.5	7.0 ± 0.5	0.3 ± 0.1	0.05	0.05	....	...	....	....	0.05 each	remainder
8	B 26 – 41 T	L	S	0.1	0.4	0.25	3.75 ± 0.5	0.6	0.05	....	...	....	0.2	0.05 each	remainder
	B 26 – 41 T	O	S	0.2	1.0	0.6	0.5 ± 0.1	....	5.0 + 0.7 − 0.2	....	...	0.5 ± 0.1	0.2 ± 0.1	0.05 each	remainder
	B 108 – 41 T	6	P	1.0 ± 0.5	1.3	12.0 ± 1.0	1.0 ± 0.25	0.05	0.1	2.5 ± 0.5	...	....	....	0.2	remainder
	B 108 – 41 T	7	P	1.5 ± 0.5	0.9	12.25 ± 0.75	0.55 ± 0.15	0.75 ± 0.15	0.4	0.05	...	....	....	0.3	remainder

[a] Tentative Specifications for Aluminum-Base Alloy Sand Castings (B 26 – 41 T), 1941 Supplement to Book of A.S.T.M. Standards, Part I, p. 314.
[b] Tentative Specifications for Aluminum-Base Alloy Permanent Mold Casting (B 108 – 41 T), 1941 Supplement to Book of A.S.T.M. Standards, Part I, p. 322.
[c] Tentative Specifications for Aluminum-Base Alloy Die Casting (B 85 – 39 T), 1939 Book of A.S.T.M. Standards, Part I, p. 1147.
[d] S = sand cast; P = permanent mold; D = die cast.

TABLE II.—ALUMINUM-COPPER AND ALUMINUM-SILICON ALLOYS.

Group	A.S.T.M. Specifications	Alloy	Cast	As Cast				Heat Treatment No. 1		Heat Treatment No. 2		Heat Treatment No. 3		Charpy Impact, ft-lb.
				Tensile Strength, psi.		Elongation in 2 in., per cent		Tensile Strength	Elongation	Tensile Strength	Elongation	Tensile Strength	Elongation	
				Minimum	Typical	Minimum	Typical	Minimum	Minimum	Minimum	Minimum	Minimum	Minimum	
1	B 26 – 41 T	C	S	19 000	....	1.0	...	....	...	....	...	....	...	...
	B 26 – 41 T	CC	S	19 000	....	1.0	...	....	...	....	...	....	...	...
	B 108 – 41 T	2	P	23 000	....	...	...	....	...	....	...	....	...	...
	B 85 – 39 T	XII	D	....	34 000	...	1.6	....	...	....	...	....	...	3.2
2	B 26 – 41 T	F	S	19 000	....	...	...	....	...	....	...	....	...	...
	B 108 – 41 T	4	P	....	....	...	...	28 000	...	38 000	...	....	...	...
	B 108 – 41 T	5	P	26 000	....	...	...	....	...	....	...	....	...	...
3	B 26 – 41 T	G	S	....	....	...	...	29 000	6.0	32 000	3.0	36 000	...	...
	B 26 – 41 T	GG	S	....	....	...	...	....	...	....	...	36 000	...	...
	B 108 – 41 T	1A	P	....	....	...	...	33 000	4.5	42 000	1.0	....	...	...
	B 108 – 41 T	3	P	23 000	....	...	...	....	...	....	...	....	...	...
4	B 85 – 39 T	VII	D	....	32 000	...	2.0	....	...	....	...	....	...	2.5
	B 85 – 39 T	IX	D	....	21 000	...	1.5	....	...	....	...	....	...	2.0
	B 85 – 39 T	VIII	D	....	29 000	...	4.0	....	...	....	...	....	...	4.5
	B 26 – 41 T	H	S	....	....	...	...	32 000	...	....	...	....	...	...
	B 108 – 41 T	11	P	....	....	...	...	33 000	...	40 000	...	....	...	...
5	B 26 – 41 T	J	S	17 000	....	3.0	...	....	...	....	...	....	...	...
	B 26 – 41 T	JJ	S	17 000	....	3.0	...	....	...	....	...	....	...	...
	B 108 – 41 T	9	P	21 000	....	2.0	...	....	...	....	...	....	...	...
	B 108 – 41 T	9A	P	21 000	....	2.5	...	....	...	....	...	....	...	...
	B 85 – 39 T	IV	D	....	29 000	...	3.5	....	...	....	...	....	...	4.5
6	B 26 – 41 T	K	S	24 000	....	5.0	...	....	...	....	...	....	...	...
	B 108 – 41 T	8	P	27 000	....	3.0	...	....	...	....	...	....	...	...
	B 85 – 39 T	V	D	....	33 000	...	1.5	....	...	....	...	....	...	2.0
7	B 26 – 41 T	N	S	....	....	...	...	....	...	32 000	2.0	25 000	1.0	...
	B 85 – 39 T	VI	D	....	30 000	...	3.5	....	...	....	...	....	...	5.0
	B 85 – 39 T	XI	D	....	32 000	...	1.7	....	...	....	...	....	...	3.0
	B 26 – 41 T	M	S	....	....	...	...	26 000	5.0	30 000	3.0	....	...	...
	B 108 – 41 T	10	P	....	....	...	...	28 000	5.0	30 000	3.0	....	...	...
8	B 26 – 41 T	L	S	22 000	....	6.0	...	....	...	....	...	....	...	...
	B 26 – 41 T	O	S	30 000 (aged)	....	3.0 (aged)	...	....	...	....	...	....	...	...
	B 108 – 41 T	6	P	....	....	...	...	28 000	...	36 000	...	....	...	...
	B 108 – 41 T	7	P	....	....	...	...	32 000	...	40 000	...	....	...	...

cent maximum. Sand castings cool relatively slowly, and when iron is present in amounts of 1.5 per cent, relatively low ductility will result, and also low strength. For good commercial sand castings where a fairly good ductility is desired, the iron content should not be over 1.3 per cent.

Experience has shown that to obtain good usable properties in sand castings, the iron content should be somewhat lower than the given limits. Iron has, in spite of the mentioned disadvantages, some good points. It decreases the hot shortness of the alloys, improves the tensile strength, yield strength, and hardness slightly, and preserves strength at elevated temperature. In combination with silicon in aluminum-copper alloys it has been found to be desirable, as shown in alloy CC. However, this is only true when the silicon content is low —less than 1.5 per cent. If the silicon content is higher, the proportion of iron to silicon is no longer important, since the higher silicon content causes the same improvement in the alloys as iron does in low silicon containing copper-aluminum alloys. However, too high an iron content in combination with high silicon is also bad. Therefore, the iron content should be kept within the limits given above to avoid poor castability, coarse crystal structure, shrinkage cracks, porosity, and brittleness.

Magnesium Must be Controlled

Magnesium is the next element in this series of alloys, and is limited to a maximum of 0.1 per cent. There is, of course, a very good reason for this. Magnesium combines with the silicon of the alloys to form an intermetallic compound Mg_2Si, which is relatively soluble in the solid aluminum. The solubility increases with increasing temperature, and it amounts to about 1.75 per cent at the eutectic temperature. By rapid chilling, some of this compound is kept in solid solution. This solid solution, however, represents an unstable condition of supersaturation. The alloy tends to revert to the stable state by precipitating the Mg_2Si in an ultra-fine dispersed form. This precipitation is accompanied by a general rapid increase in hardness, strength, proportional limit, yield strength, and an equally drastic decrease in elongation and general ductility. The more rapid the chilling of the alloy, the more Mg_2Si will be kept in solution, and the greater the hardening effect.

When the magnesium content is kept within the range of solid solution at room temperature, the hardening effect is low. It has been found that 0.05 per cent is a safe limit, although even 0.07 per cent does not cause brittleness. The embrittling effect of magnesium can be counteracted by a suitable low temperature aging treatment, such as heating a few hours at 572 deg. F. The hardening effect is the main reason for holding magnesium to such low limits. There are other reasons which might make this element desirable or undesirable depending on the use of the casting. It is said that magnesium makes the alloy sluggish—that is, harder to cast, and also hot short; however, in these low ranges it is without noticeable influence. The fact that magnesium hardens the aluminum crystal by its ability to go into solid solution even in small amounts, improves the machinability of the alloy considerably.

Manganese is an element which has many desirable functions in aluminum alloys, particularly in aluminum-copper alloys. Manganese forms simple and complex compounds with aluminum which have relatively low solid solubility in aluminum. It is a mild "hardener," increases the strength, proportional limit, yield strength, and hardness slightly with increasing amounts, and reduces the ductility gradually. Its greatest advantages are its effect on the iron-aluminum complex, which it is said changes from the harmful needle or plate type into a less embrittling form; it decreases hot shortness; and improves the properties of the alloys at elevated temperature. It is said that it reduces the castability of the alloy to some extent. However, not much difference will be found in the alloys under consideration even where manganese is present as high as 0.5 per cent (the present specification limits this element to 0.3 per cent). It also counteracts somewhat the hardening which is caused by small amounts of magnesium. Machining properties are improved by the presence of this element (72).

Zinc is one element which is permitted to be present in these four alloys to a considerable extent—as high as 2.5 per cent. Zinc was originally carried into the alloy by the old aluminum-zinc-copper alloy which contained up to 30 per cent zinc. A few pounds of this high zinc scrap, zinc castings, or borings contaminated with zinc or brass, added accidentally to the 8 per cent copper alloys causes considerable enrichment in the zinc content.

Zinc Improves Physicals

The solid solubility of zinc in aluminum is about 17 per cent at room temperature. Therefore, its hardening effect in amounts as low as 2.5 per cent is mild. It increases tensile strength, yield strength, proportional limit, and hardness somewhat, without decreasing the ductility noticeably. It improves the machinability of the alloys (*150*), has little effect on fluidity, and in amounts up to 2.5 per cent is said to improve castability. It is said to increase the hot shortness of the alloys, although the alloy specification for permanent-mold castings allows more zinc than for sand castings which is really contrary to what one would expect, since hot shortness is a more serious difficulty to overcome in an iron mold than in a sand mold. Die casters, however, allow less zinc than either sand or permanent mold casters. It is probably not for the reason of hot shortness, but rather to keep the total amount of alloying elements low. Zinc has been used in these alloys in even higher amounts —as high as 5 per cent—and still gave usable alloys.

The "other elements" in the alloys are limited to 1 per cent total amount. These elements are nickel, chromium, titanium, tin, lead, bismuth, and others mentioned before. Of these, nickel, tin, and lead are the most frequently found. Only in the die-casting alloy No. XII are nickel and tin specifically mentioned and limited to 0.5 per cent and 0.3 per cent, respectively.

Nickel forms an intermediary compound of Al_3Ni with aluminum, and in aluminum-copper-iron alloy forms complex compounds. Nickel hardens and strengthens, but also reduces ductility slightly about on the order of copper and manganese. It is slightly soluble in aluminum at room temperature. It is said to decrease hot shortness and helps to retain strength and hardness at elevated temperatures (*122*). It improves machinability due to its hardening effect. It is said to improve the color and to aid in the polishing of the casting.

Tin does not form intermetallic compounds with aluminum. It is not soluble in it, but forms a simple

eutectic with it. Its low melting point tends to increase hot shortness; therefore, its amount must be limited to about 0.5 per cent or even 0.3 per cent or less where hot shortness is a definite problem. It improves machinability considerably. It does not improve any of the other mentioned properties to any noticeable extent. Tin has been used up to 2 per cent in die castings and 5 per cent in sand castings. To some extent the hot shortness due to tin can be compensated for with silicon.

Lead Aids Machinability

Lead is also very often found in these alloys. Since lead does not mix with aluminum, it will separate from it when it is present in larger amounts. In small amounts of less than 0.5 per cent, it is usually found in the grain boundaries as small globules. Its low melting point, especially when in combination with tin, causes hot shortness; and it has been found that about 0.7 per cent of lead plus tin are the maximum allowable limits for sand and permanent mold castings. It does not influence fluidity nor the physical properties such as tensile strength, proportional limit, elongation, etc., to any detrimental extent, when present in the above limits. However, it improves the machinability of the alloys considerably (*150*).

Bismuth has seldom been found in amounts larger than 0.1 per cent in these alloys. It may be added from so-called free machining aluminum alloys or by stray pieces of bearing metals which also carry lead, tin, and sometimes antimony, into these alloys. All these elements improve the machinability of the alloys, and are otherwise relatively harmless in regard to mechanical properties when properly controlled. The total amount of all four elements should not exceed 0.7 per cent for sand and permanent mold costings. (*150*).

It should be noted that the sand-cast alloy CC allows only 0.2 per cent zinc and only 0.3 per cent other impurities. The physical requirements for this alloy are the same as for the other three alloys which are obviously more "impure." In most cases where a double specification of this type is found, a reason such as "greater ductility" or "greater corrosion resistance" is given. Since this alloy contains more than 7 per cent copper and iron plus silicon of more than 2 per cent, a few per cent of the other elements will not make the alloy less corrosion resistant. Most of the elements which contribute to castability or machinability are missing. The resultant castings may be inferior and in consequence less resistant to corrosion for the same reasons given previously. Therefore, only greater ductility should be expected from this alloy. Strangely, however, it is not so listed in the specifications. It is quite possible to obtain equal ductility from the other alloys when the alloying ingredients are properly controlled.

Table III. Frequency of Physical Properties of Permanent Mold Casting Alloy No. 2

Tensile Strength (as cast), lb. per sq. in.	Frequency, per cent	Elongation, per cent	Frequency, per cent
25 000 to 26 000	3	1 to 2	15
26 000 to 27 000	7	2 to 3	55
27 000 to 28 000	19	3 to 4	30
28 000 to 29 000	32		
29 000 to 30 000	25		
30 000 to 31 000	14		

These test bars gave general averages after casting, and after six and twelve months at room temperature aging as shown in Table IV.

In the first three alloys the minimum tensile strength and elongation required are relatively low. For permanent mold castings, only 23,000 lb. per sq. in. tensile strength and no elongation are required. An extensive study of this alloy was made by taking test bars daily from production furnaces for about three months. These bars were tested about 24 hr., six months and one year after pouring, and the change in properties recorded. It is very interesting to note that none of the test bars ever fell close to the minimum tensile strength of 23,000 lb. per sq. in. even when they had small defects and really should have been disregarded. Finally after three months of daily testing it was established that most of the test bars had a strength of 27,000 to 30,000 lb. per sq. in. and an elongation from 2 to 4 per cent. The data in Table III give the frequency of properties for several thousand bars.

These alloys have been used in great volume for widely diversified types of aluminum permanent mold and sand castings. Washing machine parts, such as agitators, gearhousings, wringer brackets; vacuum sweeper motor housings and nozzles; automobile cylinder heads, motor blocks, and crankcases; and by increasing silicon and magnesium, even pistons are successfully made from these alloys. There are many other uses to which these alloys are successfully applied. The ease with which they cast and machine and the relatively high strength have made them popular. It is surprising how little they are used in armaments, although they have very good properties comparable with many so-called higher grade alloys.

Group 2: 10 Per Cent Copper-Magnesium Alloy

The next group of alloys under consideration is a high copper alloy which has been used since before the first World War as a piston alloy. It is the 10 per cent copper alloy and its derivative, the 10 per cent copper 4 per cent silicon alloy. The main constituents are copper, iron, silicon, and magnesium. Copper at 10 per cent gives high hardness and strength at room and elevated temperatures. Iron and silicon add to these properties, as well as magnesium. The changes in properties caused by these elements are the same as discussed in group 1; thus, they need no repetition.

Magnesium, however, is in this alloy as an important desired element and makes possible the hardness which is obtained by proper casting and heat treatment. When properly heat treated, this alloy has hardness in the range of 100 to 140 Brinell, good machinability, and good bearing qualities.

It is interesting to note that *iron* in the alloys specified in B 26-41 T and B 108-41 T is allowable up to 1.5 per cent independent of the mode of casting—that is, sand casting or permanent mold casting. However, the silicon content in the sand-cast alloy is dependent on the iron content, and a total of both together of 2 per cent is allowable. That means, if the iron content is 1 per cent, only 1 per cent of silicon can be used. In the chill-cast alloy, 1 per cent of silicon can be used independent of the iron content. It is known, however, that silicon increases fluidity of aluminum alloys and also decreases

Table IV. General Averages of the Alloy shown in Table III, as Cast and after Room Temperature Aging. Chemical Analysis is shown below.

	Elongation, per cent	Tensile Strength, lb. per sq. in.	Brinell Hardness
As cast	2.6	29 300	69
6 months	1.9	32 000	77
12 months	1.8	33 300	83

	Copper	Iron	Silicon	Zinc	Magnesium	Manganese	Nickel	Tin	Lead	Titanium
Minimum	6.10	1.20	1.90	1.60	0.01	0.13	0.20	0.20	0.30	0.03
Maximum	7.10	1.45	2.80	2.40	0.06	0.25	0.40	0.50	0.40	0.05
Average	6.75	1.37	2.40	1.80	0.04	0.17	0.35	0.35	0.35	0.04

shrinkage and by actual experience it has been found that stronger castings can be made when the silicon is increased to a minimum of 1.4 per cent. The proper proportioning of iron and silicon for the casting depends greatly on the intricacy of the design. The simpler the casting, the less important the proportioning. The higher the iron content, the more silicon is desirable. If, however, the silicon is more than 2 per cent, the iron should be kept below 1.3 per cent to avoid undue brittleness—illustrated in alloy 5.

Manganese imparts the same properties to this alloy as mentioned before and has marked advantage even up to 1 per cent, since it improves hardness and strength at elevated temperatures. It should be limited only by the fact that it decreases fluidity; but up to 0.7 or 0.8 the alloy casts without undue difficulty (*72, 88*).

Nickel imparts about the same properties as manganese and can be used in greater quantities. In the permanent mold alloy it is limited to 0.03 per cent, and in the sand-cast alloy to even less. It can be used in much higher amounts such as 0.5 or even 1 per cent.

Zinc is limited in these alloys to 0.2 to 0.5 per cent. The sand-casting alloy has the lowest permissible zinc content. The properties obtained by the addition of zinc are the same in this alloy as in the No. 12 alloy. The greatest objection to zinc is the belief that zinc causes hot shortness and, therefore, weakness at elevated temperature. This idea probably dates back to the time when alloys with ten or more per cent of zinc were commonly used. It is very interesting to note from the specifications that in sand castings weakening of the alloy is expected to occur when more than 0.2 per cent zinc is present, while in chill castings 0.4 or 0.5 per cent is permissible, in spite of the fact that chill castings are much more troubled by hot shortness or weakness at elevated temperatures than sand castings. It seems logical, therefore, to assume that the specifications are not founded on facts. The author's tests in the effect of zinc on this alloy confirm that zinc is a harmless element as shown in Table V.

In these tests the hot shortness decreased gradually with the addition of zinc. This seems to confirm that zinc up to 1.2 per cent has no deleterious influence on this alloy and can be used in greater amounts.

The *other elements* such as lead, tin, bismuth, and chromium, etc., including nickel in two of the alloys are limited to 0.3 to 0.5 per cent, respectively. If nickel is excluded for the above-given reasons from this list, then about 0.5 per cent of the "other elements" would greatly aid in the machinability of the alloy. The effect of the individual elements has been discussed in the No. 12 alloy and nothing new can be added in this case.

Alloy No. 5 is practically the same as alloy No. 4, only that 3 per cent silicon has been added, probably to increase the fluidity of the alloy. This alloy is, however, not used a great deal. It is interesting to note that in alloy No. 4 not more than 1 per cent silicon is allowable while in No. 5, 3.5 to 4.5 per cent silicon is wanted. It does not seem justified to conclude that the alloys with silicon from 1 to 3.5 per cent are useless.

It should be noted, however, that the composition of most alloys is very flexible and all the maximum limits of all elements given in the specifications cannot be used in any one alloy, since a second limitation —the physical property specifica-

Table V. 10 Per Cent Copper Alloy.

Zinc, per cent	Tensile Strength, lb. per sq. in.		
	Room Temperature	302 deg. F.	437 deg. F.
0.10	32 100	30 300	28 600
0.25	32 300	31 500	28 500
0.40	33 500	31 700	28 400
0.79	34 700	31 800	28 200
1.22	33 700	31 600	28 700

Table VI. Variations Within the Chemical Limits of Alloy No. 5. Alloy C is Added for Comparison.

Alloy	Copper, per cent	Iron, per cent	Silicon, per cent	Magnesium, per cent	Manganese, per cent	Nickel, per cent	Zinc, per cent	Others, per cent	Total Hardener, per cent
A	9.25	0.2	0.2	0.15	0.03	0.00	0.01	0.05	9.89
B	10.75	1.5	1.0	0.35	0.3	0.3	0.4	0.3	14.90
C	9.5	1.1	1.6	0.25	0.4	0.35	0.06	0.5	14.3

tion—controls the total amount of the alloying elements. To illustrate, we might choose the following examples:

Within the chemical limits of alloy 5 it is possible to produce alloys of greatly varying properties. An alloy with all elements at the low limits would be weak and soft and difficult to cast and machine, while an alloy with all elements at the high limits would be brittle. In Table VI the two extremes are illustrated as A and B. Alloy C has been added to the table for purposes of comparison.

Although this alloy does not conform to the chemical specification, the casting and machining properties are excellent and the physical properties are equal to or better than those alloys within the specification. The fact is that thousands of tons of pistons made of alloy C have been used for many years with great success in competition with the alloys F and 4.

Group 3: 4 Per Cent Copper-Silicon Alloys

This group of alloys actually contains three subgroups in which the silicon content varies in accordance with the mode of casting. Alloys G and GG of Specifications B 26 have a silicon content of 1.2 per cent maximum and are sand-casting alloys. Alloy 1-A of Specifications B 108 contains 2 to 3 per cent silicon for permanent mold casting to increase the castability; alloy 3 of the same specification contains 5 to 6 per cent silicon for more complicated castings. This same alloy is also used for die casting. This indicates plainly that silicon is a desirable element when fluidity or castability is wanted.

Iron in these alloys imparts the same properties as discussed before and need not be repeated.

Magnesium and all the other elements act identically in these alloys as in No. 12 type alloy or the 10 per cent copper alloy.

There is, however, one very interesting comment to make on the sand-cast alloys G and GG. A decided difference exists in the minor alloying elements. Alloy G is of greater purity. Since corrosion is not influenced by relatively small amounts of minor alloying elements when more than 4 per cent copper is present, the only other objective in holding these elements so low would be to obtain greater ductility. The ductility, however, is greatly influenced by the presence of magnesium; hence, when ductility is required, it would be necessary only to reduce the magnesium content of alloy GG to 0.05 per cent. In either alloy the desired ductility can then be obtained provided the iron content be low enough (1 per cent max.) to facilitate heat treating. High iron reduces the ductility more than the presence of other elements such as manganese, nickel, zinc, and even lead and tin. It is found in the literature that small additions of silicon, magnesium, nickel, iron, and zinc improve the castability of the alloy (*152, 164, 173, 206*) while titanium lowers the elongation (*76*). Both alloys need titanium as a grain refiner which indicates that they are difficult to use for complicated castings. In other words, common alloying elements which will improve castability cannot be used in alloy G, but titanium can be added to counteract the deficiency in castability. Small amounts of minor elements are very desirable in this alloy: (1) for the reasons given above, and (2) to improve the poor machinability of the alloy. Again it should be recalled that the physical properties are the yardstick for the quality of the alloy, and the chemical specification only a guide for the user.

Secondary Heats

Table VII illustrates the properties found on commercial (secondary) heats of alloy of the type covered by Specifications B 26, alloy G. They show that quite satisfactory properties are obtained through a wide variation in composition. It should be noted that the elongation is lower than in the high pure alloys, but the yield strength is appreciably higher.

The permanent-mold alloy No. 1A of Specifications B 108 suffers from the same deficiency of minor alloying elements, as the alloys G and GG above. It has been found in practice that the *iron* content in this alloy can be considerably higher than in the sand-cast alloys of this type and up to 1.20 does not interfere with the ductility or heat treatment (*179*).

Magnesium interferes with ductility and should not be higher than 0.05 per cent where more than 4 per cent elongation is desired.

Manganese can be used up to 0.7 per cent; *nickel* up to 0.5 per cent; *zinc* up to 1.2 per cent. Lead, tin, cadmium, bismuth, chromium, and titanium have the same influence

Table VII. Sand-Cast 4 Per Cent Copper Alloy

Test Number	Chemical Composition, per cent											
	Copper	Iron	Magnesium	Manganese	Nickel	Silicon	Zinc	Lead	Tin	Bismuth	Chromium	Titanium
X 250	4.1	0.32	0.01	0.64	0.02	0.70	0.07	0.14	0.14	0.14	0.01	0.02
X 251	3.96	0.88	0.01	0.46	0.05	1.07	0.15	0.10	0.10	0.04	0.03	
X 265	4.32	1.12	0.04	0.14	0.04	0.70	0.70	0.24	0.12	0.08	0.03	0.03
X 268	4.57	0.92	0.07	0.26	0.14	0.93	0.56	0.10	0.16	0.04	0.03	0.05
X 197	4.21	0.68	0.06	0.43	0.05	0.86	0.39	0.14	0.10	0.07	0.01	

Physical Properties

Heat Treatment: 12 Hr. 960 deg. F., Quenched, Aged 1 Hr. at 212 deg. F.

Test Number	Hardness Rockwell, "E" scale	Proportional Limit, lb. per sq. in.	Yield Strength, lb. per sq. in.	Tensile Strength, lb. per sq. in.	Elongation 2 per cent
X 250	71	12 900	17 400	30 500	5.2
X 251	70	10 500	16 300	30 800	5.4
X 265	66	12 300	18 000	30 500	5.1
X 268	74	16 300	24 000	34 000	4.0
X 197	67	15 000	21 600	33 400	4.5

as mentioned before and should be used for good machinability.

Table VIII gives an interesting résumé of the statements made for alloy 1A (Specifications B 108). For two years tests have been conducted on every heat of metal made. More than 14,000 bars were tested and the properties and analyses statistically recorded. The table gives the frequency of tensile strength and elongation as they were found in 1939 and 1940, and also the average for the 2-yr. period. The majority of alloys tested between 36,000 and 42,000 lb. per sq. in. tensile strength and 5 and 8 per cent elongation. The chemical analysis during these two years varied between the limits given in the table. It also should be mentioned that all these heats were accepted by our armed forces and used for war production.

The alloy 3 of Specifications B 108 is used for complicated castings of which relatively low properties are required. It should not be compared with the alloys above as far as ductility is concerned. However, the influence of the minor alloying elements is the same on this alloy, and they should be used to the same advantage. The properties of this alloy could be improved considerably by heat treatment.

Table VIII. Frequency of Properties of 4 Per Cent Copper, 2 Per Cent Silicon Alloys.*

Chill Cast: Solution heat treated; aged 2 hr. at 212 deg. F.

Tensile Strength, lb. per sq. in.	Frequency, per cent		
	1940 Period, 8825 Bars	1939 Period, 5462 Bars	Average
33 000 to 34 000	0.0	1.0	0.5
34 000 to 35 000	0.7	2.4	1.5
35 000 to 36 000	6.9	7.4	7.1
36 000 to 37 000	13.4	11.6	12.5
37 000 to 38 000	16.4	13.6	15.0
38 000 to 39 000	17.7	16.9	17.3
39 000 to 40 000	16.2	17.0	16.6
40 000 to 41 000	14.2	13.7	12.5
41 000 to 42 000	9.9	10.9	10.4
42 000 to 43 000	4.5	3.7	4.1
43 000 to 44 000	0.5	1.5	1.0
44 000 to 45 000	0.3	0.3	0.3

Elongation, per cent	Frequency, per cent		
	1940 Period, 8825 Bars	1939 Period, 5462 Bars	Average
4 to 4.5	0.0	0.3	0.1
4.5 to 5	1.0	3.4	2.2
5 to 6	21.1	25.7	23.4
6 to 7	47.7	46.0	46.6
7 to 8	24.5	20.6	22.5
8 to 9	5.4	3.7	4.6
9 to 10	0.8	0.3	0.5

Chemical Analysis of Alloys, per cent

	Copper	Iron	Magnesium	Manganese	Nickel	Silicon
Low	3.9	0.8	0.01	0.2	0.1	1.9
High	4.7	1.1	0.07	0.6	0.5	2.8
	Zinc	**Tin**	**Lead**	**Chromium**	**Bismuth**	**Titanium**
Low	0.1	0.1	0.05	0.01	0.0	0.02
High	0.6	0.2	0.20	0.15	0.1	0.20

* Specification: 33,000 lb. per sq. in. tensile strength; 4.5 per cent elongation, minimum.

Group 4

The same alloy No. 3 is found as No. VII of Specifications B 85 as a die-casting alloy. However, the composition as far as minor elements are concerned is much different.

The iron content is more than twice as high as in the permanent mold alloy and undoubtedly too high to give maximum properties. This limit of 2.3 per cent was set to accommodate the die caster of olden times, who had difficulties in preventing iron pickup from the die-casting machines. However, in modern machines of the cold-chamber type, the aluminum does not pick up much iron, and it should be possible to reduce the iron content and thus improve the ductility of the alloy.* Magnesium is high enough to cause age hardening at room temperature; it should by no means exceed 0.1 per cent.

Manganese is considered quite beneficial in die-casting alloys since it is said to prevent the sticking of the casting to the die. Furthermore, it reduces hot shortness and modifies the effect of high iron. Therefore, it is a very desirable element for the die caster and its content in this alloy should be increased to 0.6 per cent (*72, 88*).

It is again interesting to note that zinc is tolerated up to 1 per cent in die castings although it is said to cause hot shortness in sand and permanent-mold castings when used in excess of 0.2 or 0.4 per cent.

Tin is also permissible in die-casting alloys while it is said to cause hot shortness in other modes of casting.

Nickel is permissible up to 0.5 per cent. If it does no harm in the die-casting alloy it should also be harmless or equally beneficial in the sand and permanent mold alloys of this type.

In alloy IX of Specifications B 85 the silicon content is decreased to about 2 per cent and the nickel increased to about 4 per cent. This is, of course, a different alloy and cannot be directly compared with the alloy VII. However, it has nearly the same physical properties. The iron content is somewhat lower, but manganese is still 0.3 per cent maximum as in most other alloys, although higher amounts are beneficial for the above reasons. The two alloys are practically obsolete and specifications have not been modernized. But they are still carried in the specifications.

The most interesting part of alloy IX of Specifications B 85 is the high nickel content. While thus far nickel has been treated as an undesirable impurity, in this alloy it is considered a desirable alloying element. This alloy has nearly the same physical properties as alloy VII. It is further interesting to note that the only difference between the two alloys is the replacement of 3 per cent of silicon in alloy VII by 3 per cent nickel in alloy IX. Both have nearly the same properties. This seems to imply that 1 per cent of silicon is equivalent to

* This has been recognized lately and new specifications have been approved in which the iron content has been reduced in castings made on the gooseneck machines to 2.0 per cent and on cold chamber machines to 1.3 per cent. These alloys are now known as VIIA and VIIB, respectively.

1 per cent of nickel in copper-aluminum alloys. In alloy VIII the copper is much lower than in the previous alloys. The silicon content is also down to near 1 per cent, and the nickel content is reduced to about 2 per cent. This alloy exhibits greater ductility than most of the other die-casting alloys. The iron content is higher than in alloy IX, and the magnesium content also is higher, reducing the ductility of the alloy to some extent. Manganese as usual is 0.3 per cent. The zinc content, however, has been reduced to 0.5 per cent. It is hardly reasonable to suppose that in this alloy which has basically the same composition as the two previously mentioned alloys, more than 0.5 per cent zinc should be harmful. Since zinc is a very mild hardener and is also desirable as far as castability is concerned, the zinc limit could be increased to 1 per cent.

Y—Alloy

The next two alloys, alloys H and 11, the sand-cast specification and permanent-mold specification, constitute an old alloy generally known as Y-alloy. In both alloys the chemical specifications are identical. The physical specifications differ slightly. The stand-casting alloy requires a minimum of 32,000 lb. per sq. in. while for the permanent-mold casting a minimum of 33,000 lb. per sq. in. tensile strength is required under heat treatment No. 1. The three main alloying constituents of the alloy are copper, magnesium, and nickel. Copper is within the limits of 3.5 to 4.5 per cent, as in many of the previous alloys. Nickel is limited to 1.7 to 2.3 per cent, and the interesting element in this alloy, magnesium, from 1.2 to 1.8 per cent. This is the first alloy we have considered in which magnesium is desired in amounts above 1 per cent, and we have thus gone through three stages: (1) magnesium as an undesirable impurity; (2) as a desirable element in small amounts; (3) as a desirable element in higher amounts. Magnesium has a high affinity for silicon and forms the hardening compound, magnesium silicide. It is, therefore, necessary to limit the silicon to low amounts, and in this case, 0.7 per cent is the maximum allowable (*44*). If higher amounts are present, the hardness is so great that the alloy becomes nearly brittle.

The nickel content imparts to this alloy its resistance to softening at elevated temperature (*110, 122*). This alloy has been used for many years for cylinder heads and pistons where relatively high temperatures prevail. The manganese content is again limited to 0.3 per cent as in most of the other alloys thus far, and there seems to be no basis for this limitation. It has been found by experience that nickel and manganese can be partly substituted for each other, and if higher manganese is found in the alloy, not as much nickel is necessary to get the same results. At this time the supply of manganese seems to be less critical than nickel. Hence, it would be of advantage to use manganese to partially replace nickel in such alloys as Y (H and 11). Even with nickel at the top limit of the specification, the higher manganese content may be desirable. Zinc has been limited in these alloys to an extraordinary extent. The earlier specifications for these alloys limited zinc to 0.01 per cent. Later this specification was "relaxed" and 0.03 was allowed. Within the past year or so the zinc limit was increased to 0.1 per cent. This low limit was supposed to prevent hot shortness in the alloy. This supposition, of course, is wrong, since it has been found definitely that zinc does not cause hot shortness. Tests made by the author on these alloys indicate that zinc content as high as 3 per cent does not decrease the strength at elevated temperature. In fact, it increases the the strength at room temperature and the alloy maintains its strength at elevated temperatures as shown in Table IX.

Zinc Added

Zinc was added to the alloy in steps of 0.2 per cent up to 1.3 per cent, and an increase in tensile strength was noted. Also an increase in hardness can be observed. With this increase in tensile strength and hardness, the hot shortness as measured in a permanent mold was reduced from 20 per cent on the zinc-free alloy to 8.5 per cent on an alloy containing 1.3 per cent zinc. It will be seen in the table that the alloy containing 1.3 per cent zinc has a tensile strength of 37,800 lb. per sq. in. at room temperature, and at 302 deg. F. the alloy has a tensile strength of 36,000 lb. per sq. in. At 437 deg. F. the strength is 34,000 lb. per sq. in. The alloy without zinc never reaches such a high tensile strength at room temperatue. At 437 deg. F., the alloy containing 1.3 zinc is 10 per cent stronger than the alloy containing no zinc.

A heat treatment, corresponding to heat treatment No. 2, and also a treatment A to produce greater ductility was give to these alloys. These tests gave properties as shown in Table X.

These tests demonstrate conclusively that zinc is a desirable addition to this alloy—it increases the tensile strength and hardness without reducing the elongation. The

Table IX. Properties of Alloys H and 11, so called Y-Alloy.

Copper, per cent	Iron, per cent	Magnesium, per cent	Silicon, per cent	Nickel, per cent
4.10	0.39	1.63	0.23	1.83

Zinc, per cent	Tensile Strength, lb. per sq. in.			Brinell Hardness		
	Room Temperature	302 deg. F.	437 deg. F.	Room Temperature	302 deg. F.	437 deg. F.
0.03	32 200	31 100	30 000	91	89	90
0.22	34 800	34 300	31 200	92	93	93
0.42	35 500	33 500	31 800	93	95	95
0.66	36 100	34 200	32 900	97	95	98
0.76	36 500	35 000	33 000	99	100	99
1.34	37 800	36 100	34 000	101	100	99

Table X. Effects of Heat Treatment on H and 11 Alloys.

Zinc, per cent	Tensile Strength, lb. per sq. in.	Elongation, per cent	Brinell Hardness	Heat Treatment
0	50 000	0.5	114	2
1.3	59 000	0.5	125	2
0	47 500	1.5	110	A
0.7	51 000	1.5	121	A
1.3	52 000	1.5	127	A

increase in tensile strength in this alloy by addition of zinc is remarkably high. It can be increased as much as 20 per cent, by adding 1.5 per cent zinc, without reducing the ductility of the alloy noticeably.

The other elements in the alloy of this specification are kept to 0.3 per cent. These other elements include lead, tin, and titanium which are frequently added to improve the machinability of the alloy. A higher percentage, such as 0.5 or 0.6, of these elements will improve the machinability without interfering with the physical properties of the alloy. The iron content is limited to 1 per cent* which probably is correct for the sand-casting alloy although the permanent-mold alloy could stand somewhat higher iron without losing any of the desirable qualities. Especially when a higher amount of manganese is present, the iron could be as high, probably, as 1.4 per cent.

These two alloys complete this study of a group of alloys in which copper is really the main alloying element. The copper content ranges from 10 per cent down to 7, 4, and finally 2 per cent. The intentional additions to these alloys are silicon, nickel, and magnesium. All other alloying elments present in these alloys are considered as impurities, but even some of the main additions are considered impurities in many of the alloys. For example, the magnesium is generally considered as an undesirable impurity. Also the nickel is considered in most alloys as an undesirable impurity. And even silicon, in some of the alloys, is not desired. In summarizing it should be noted that in copper alloys, silicon is always desirable since it increases the fluidity of the alloy and also reduces the hot shortness. The only alloy where silicon is not desired is the Y-alloy, in which the magnesium forms magnesium silicide, a powerful hardening compound. Magnesium is not desired in most of the alloys with the exception of the 10 per cent copper alloy and Y-alloy. In the 10 per cent copper alloy only small amounts such as 0.3 per cent are necessary to cause sufficient hardening. In Y-alloy about 1.5 per cent is specified to give the desired properties. Nickel is very much desired when high strength at elevated temperature is required. It should be logical to suppose that this property is also desirable in other alloys, and a rigid limitation of nickel at percentages such as 0.1 to 0.3 per cent should be avoided.

Manganese seems to be limited to 0.3 per cent in most of the alloys for no apparent reason, and since it imparts very desirable properties to the aluminum alloys, it would be wise to increase the amount of manganese considerably, to get properties such as reduced hot shortness, reduced brittleness, higher strength at elevated temperatures, better machinability, and better dissemination of the iron compound in the alloy. Zinc, of course, is the element which has been most badly "maligned" and enough has been said in the previous paragraphs about zinc so that it does not need to be repeated here. The iron content depends largely on the mode of casting and, as stated above, it does not have to be as high in the die casting as the specifications allow, while in some of the permanent-mold casting alloys the content could be increased slightly without ill effect. The other alloying elements such as lead, tin, bismuth, and antimony all improve the machinability of the alloys and seldom reach very high amounts, probably very seldom 1 per cent total. They are neither hardening nor embrittling, can be controlled properly, and therefore are relatively harmless.

Nonmetallic Impurities

One subject has not been discussed in all these alloys, and that is the question of nonmetallic impurities, such as oxides, nitrides, and the like. The statement is often made that remelt alloys contain more oxides than so-called high-purity alloys. It is unfortunate indeed that it is not possible to analyze for aluminum oxide and obtain reliable results which can be consistently repeated. There is not one method which has been approved as dependable by any group of scientists. Therefore, it is easy for anyone to make the above statement. However, there is sound reasoning which can disprove it. Virgin aluminum, as it comes from the reduction cell, where it is born out of oxides, is loaded with oxides and fluxes to such an extent, that to make it usable, it has to be remelted and cleaned of these impurities by fluxing, skimming, and holding in the furnace. Fluxing, skimming, and holding the metal are identical procedures in the production of virgin and remelt metal, and there is no basis for the assumption that these methods work any differently on virgin aluminum than on remelt aluminum.

When the above-mentioned refining methods are employed, it is possible to "purify" aluminum, even virgin, from nonmetallics to such an extent that it becomes coarse crystalline so that castings made from it are unsatisfactory, due to shrinkage. When, by the use of modifiers, oxides or other nonmetallics are again introduced into aluminum alloys, the casting properties are improved and the metal exhibits superior properties to the super-purified metal. There is a definite similarity in other metals such as, for example, fine-grained steel.

It is, of course, possible to remelt aluminum and not remove the excess of nonmetallics properly. This often happens when foundries reclaim their own scrap without adequate facilities and technique to condition the metal properly. This is most likely the reason why nonmetallic impurities and r e m e l t metal have become so closely associated in the minds of many. They do not realize that primary aluminum must be remelted to remove the nonmetallics. This same reasoning must be brought forth when the gas content of these alloys is considered.

"Remelted" aluminum has been in competition with primary metal for many years, and when the composition of the remelted aluminum is comparable with that of primary, no difference in properties is found. That should be conclusive, both on the question of oxides and on any other prejudicial opinions regarding remelt aluminum.

Minor Elements Not Harmful

Indications are that, with certain exceptions noted below, the effect of the minor alloying elements on the mechanical properties of aluminum-copper, aluminum-copper-silicon, and aluminum-copper-nickel alloys is either beneficial or innocuous. The only element which requires rigid control is magnesium. In all these alloys (with the exception of the 10 per cent copper and the Y-alloy) 0.10 per cent magnesium is the maximum which can be tolerated without causing loss in ductility. In cases where ductility is of prime importance, limitation of magnesium to 0.05 per cent is indicated.

Iron is the next element which must be watched carefully. Since

* Tests are conducted today to substitute 1 per cent nickel in this alloy by 1 per cent added iron giving a total of 2 per cent iron.

much of the contamination arises through the foundry process, every precaution should be taken to prevent unnecessary iron pickup. This is the more serious as the silicon content increases.

All the other elements such as manganese, titanium, nickel, chromium, and cobalt in one group; and tin, lead, antimony, bismuth, and cadmium in another group, are usually present in small enough amounts so that there is no harm; in fact, we pointed out, in many cases great advantages occur when they are present. Furthermore, with good laboratory control and proper technique, these elements can be balanced so that the maximum benefit is gained by their presence.

One fact should be stated: that in many cases the presence of the elements mentioned in the above discussion sometimes changes the casting characteristics—and some adjustments in the foundry practice may have to be made to suit the alloy. In many cases, the alloys have a somewhat lower melting point and greater fluidity; therefore, the pouring temperatures can be lowered.

Design Aspects

There seems to be a question about what are the important physical properties on which the designer and engineer can rely. In most specifications only a minimum tensile strength and elongation are given which would imply that these two are the only properties which the engineer requires. In many alloys the elongation seems to be of prime importance. It is, however, certain that a casting stressed to an extent of considerably less than one-half of the required 6 per cent minimum elongation could only be used where dimensional stability does not matter. A casting must be strong enough to resist deformation. The measure for resistance to the earliest stages of permanent deformation is the proportional limit and the yield strength and not the elongation and tensile strength found in a fractured test bar or casting. It appears reasonable to class an alloy having 16,000 lb. per sq. in. proportional limit, 24,000 lb. per sq. in. yield strength, 34,000 lb. per sq. in. tensile strength, and only 4 per cent elongation superior in regards to dimensional stability under stress to an alloy having only 10,000 lb. per sq. in. proportional limit, 16,000 lb. per sq. in. yield strength, 34,000 lb. per sq. in. tensile strength, and 8 per cent elongation. Differences of this order are commonly found between remelt aluminum alloys and primary alloys. Remelt alloys usually exhibit the greater proportional limit and yield strength and somewhat lower elongation. It therefore seems advisable to supply the designing engineers with data on proportional limit and yield strength in addition to the present information on tensile strength and elongation. If these data were made available for aluminum alloys, the question of composition would be simplified.

N. E. Steel Classifications Expanded

FOR several months now the 8600 and 8700 series of National Emergency Steels, developed to conserve alloying elements, have been written into specifications by the WPB in place of standard and more highly alloyed steels. It has been increasingly obvious, however, that these steels would have to be in turn supplemented in part and replaced in part by analyses of even lower alloy content, if enough alloying material were to be available fully to meet all armament needs.

Consequently, a new and more complete list of NE steels has been developed, as shown here. Although these new steels may still be subjected to a few minor changes, they certainly will soon appear practically as shown here in many specifications as early as next month. Also, the alloy situation is so critical that the Army, Navy and Air Corps will all likely swing many specifications to these new types with greater rapidity than has been their habit in the past.

The WPB requested development of this new list of NE analyses in order to further conserve nickel and molybdenum. The new steels take into consideration the extended use of silicon and manganese to offset reductions in other elements, and to make even further use of residuals now available in scrap.

These new NE steels cover some of the old NE 8600 and 8700 analyses, as well as the old 1300 and 9200 standard steels. Added are a group of Mn-Si-Cr steels to replace the Mn-Mo steels; and a new 9400 series of Mn-Si-Cr-Mo analyses to take advantage of scrap residuals and decreasing Cr, Ni and Mo percentages. Chromium has been decreased in the 9400 series.

This new list of NE steels may have some added additions in the near future and finally may contain about 18 base compositions and 47 specifications, the analyses being as shown in the accompanying tables:

Silico-Manganese and Silico-Manganese-Chrome Steels

	C	Mn	Si	Cr
NE 9255	0.50/0.60	0.75/1.00	1.80/2.20	.....
NE 9260	0.55/0.65	0.75/1.00	1.80/2.20	.....
NE 9262	0.55/0.65	0.75/1.00	1.80/2.20	0.20/0.40

Carbon-Manganese Steels

	C	Mn	Si
NE 1330	0.28/0.33	1.60/1.90	0.20/0.35
NE 1335	0.33/0.38	1.60/1.90	0.20/0.35
NE 1340	0.38/0.43	1.60/1.90	0.20/0.35
NE 1345	0.43/0.48	1.60/1.90	0.20/0.35
NE 1350	0.48/0.53	1.60/1.90	0.20/0.35

Manganese-Molybdenum Steels

	C	Mn	Si	Mo
NE 8020	0.18/0.23	1.00/1.30	0.20/0.35	0.10/0.20
NE 8022	0.20/0.25	1.00/1.30	0.20/0.35	0.10/0.20
NE 8442*	0.40/0.45	1.30/1.60	0.20/0.35	0.30/0.40

* Recommend for large sections only.

Manganese-Silicon-Chrome-Nickel-Molybdenum Steels

	C	Mn	Si	Cr	Ni	Mo
NE 9415	0.13/0.18	0.80/1.10	0.40/0.60	0.20/0.40	0.20/0.40	0.08/0.15
NE 9420	0.18/0.23	0.80/1.10	0.40/0.60	0.20/0.40	0.20/0.40	0.08/0.15
NE 9422	0.20/0.25	0.80/1.10	0.40/0.60	0.20/0.40	0.20/0.40	0.08/0.15
NE 9430	0.28/0.33	0.90/1.20	0.40/0.60	0.20/0.40	0.20/0.40	0.08/0.15
NE 9435	0.33/0.38	0.90/1.20	0.40/0.60	0.20/0.40	0.20/0.40	0.08/0.15
NE 9437	0.35/0.40	0.90/1.20	0.40/0.60	0.20/0.40	0.20/0.40	0.08/0.15
NE 9440	0.38/0.43	0.90/1.20	0.40/0.60	0.20/0.40	0.20/0.40	0.08/0.15
NE 9442	0.40/0.45	1.00/1.30	0.40/0.60	0.20/0.40	0.20/0.40	0.08/0.15
NE 9445	0.43/0.48	1.00/1.30	0.40/0.60	0.20/0.40	0.20/0.40	0.08/0.15
NE 9450	0.48/0.53	1.20/1.50	0.40/0.60	0.20/0.40	0.20/0.40	0.08/0.15

Carbon-Chrome Steels

NE 52100 A	0.95/1.10	0.25/0.45	0.20/0.35	0.40/0.60	0.35 max.	0.08 max.
NE 52100 A	0.95/1.10	0.25/0.45	0.20/0.35	0.90/1.15	0.35 max.	0.08 max.
NE 52100 A	0.95/1.10	0.25/0.45	0.20/0.35	1.30/1.60	0.35 max.	0.08 max.

Chrome-Nickel-Molybdenum Steels

	C	Mn	Si	Cr	Ni	Mo
NE 8613	0.12/0.17	0.70/0.90	0.20/0.35	0.40/0.60	0.40/0.60	0.15/0.25
NE 8615	0.13/0.18	0.70/0.90	0.20/0.35	0.40/0.60	0.40/0.60	0.15/0.25
NE 8617	0.15/0.20	0.70/0.90	0.20/0.35	0.40/0.60	0.40/0.60	0.15/0.25
NE 8620	0.18/0.23	0.70/0.90	0.20/0.35	0.40/0.60	0.40/0.60	0.15/0.25
NE 8630	0.28/0.33	0.70/0.90	0.20/0.35	0.40/0.60	0.40/0.60	0.15/0.25
NE 8715	0.13/0.18	0.70/0.90	0.20/0.35	0.40/0.60	0.40/0.60	0.20/0.30
NE 8720	0.18/0.23	0.70/0.90	0.20/0.35	0.40/0.60	0.40/0.60	0.20/0.30
NE 8722	0.20/0.25	0.70/0.90	0.20/0.35	0.40/0.60	0.40/0.60	0.20/0.30
NE 8735	0.33/0.38	0.70/0.90	0.20/0.35	0.40/0.60	0.40/0.60	0.20/0.30
NE 8739	0.35/0.40	0.70/0.90	0.20/0.35	0.40/0.60	0.40/0.60	0.20/0.30
NE 8744	0.40/0.45	0.70/0.90	0.20/0.35	0.40/0.60	0.40/0.60	0.20/0.30
NE 8749	0.45/0.50	0.70/0.90	0.20/0.35	0.40/0.60	0.40/0.60	0.20/0.30
NE 8949*	0.48/0.50	1.00/1.30	0.20/0.35	0.40/0.60	0.40/0.60	0.30/0.40

SPEED THE CARRIERS

Scrap is urgently needed for the naval expansion program. You, in your plant, can help speed the aircraft carriers. The job is much more than collecting scrap metal about the plant. It is a job of wrecking obsolete equipment, cleaning out unusable stocks, obsolete tools, dies and fixtures. Don't think that a few hundred pounds of scrap isn't important. Get it all back into the market—by the pound, the ton or the carload. Assign a competent executive to do this jol. Get in the scrap.

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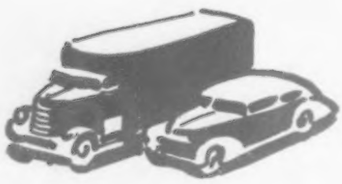
Assembly Line . . .

• Progress report on auto industry, made by WPB, shows war production gaining momentum after a slow beginning . . . Chrysler changes over to new model tanks . . . Maintenance school opened.



DETROIT—In a recent progress report of the automotive industry, made by the local office of the War Production Board, dollar value of shipments, plant utilization, employment, and payrolls are revealed. Based on data obtained from 387 plants of 133 automotive companies, the progress report represents about 68 per cent of the industry on the basis of February, 1942, employment, but is generally conceded to be indicative of the remainder of industry insofar as trends are concerned. While the value of shipments and unfilled orders are reported to May only, the employment, payrolls and plant utilization figures include June.

According to June estimates, the peak value that monthly shipments would eventually reach was $1,363,529,000, up $673,405,000 from the previously estimated peak. Of this total possible shipment value, it is estimated that $1,338,499,000 worth of the shipments would be on direct war orders. Likewise, an estimated monthly employment peak is shown to be 1,052,877 workers, employed for a total of 208,109,000 man-hours per month.

In comparing these estimated peaks, a pattern of employment against production can be observed. To meet the estimated peak, June employment, totaling 576,098 workers, must be doubled, but the dollar value of shipments, based on May's shipments worth $427,598,000, must be tripled to reach its estimated peak. This of course is not quite as amazing as it sounds, since there is not a definite arithmetical relationship between employment and production.

After a slow beginning, war production is now rapidly gaining momentum. While the February production of the reporting plants was only 61.9 per cent war goods, that picture is now entirely changed. From the 61.9 per cent war shipments in February, there was a jump of 21.3 points to 83.2 in April. Of the $427,598,000 worth of orders shipped in May, $380,448,000, or 89 per cent, was accounted for by shipments of direct war orders. From the incomplete returns on June reports on shipments, there is every reason to believe that June shipments of war orders will reach at least 90 per cent of the total value of material shipped. Furthermore, it is obvious that June shipments by reporting companies will also break all previous records insofar as dollar value is concerned, and before the end of the year, shipments not on war orders by those companies will be negligible.

LIKE shipments, employment has also been on the increase. During the month of April of this year, 503,782 wage earners were employed by the reporting companies, with the total for June being 576,098, and payrolls jumping from $23,483,000 in April to $30,760,000 in June.

Indications that expansion progress in these plants are rapidly being completed is apparent from the figures showing the total amount of space used. During April of this year, 121,418,000 sq. ft. of floor space was utilized for productive activities but with pressure on the plants for increased production and new plants coming into operation, some 141,253,000 sq. ft was reported in use in June.

An interesting sidelight to the report made by WPB was the breakdown of employment of production wage earners by shifts. This breakdown is shown in the accompanying compilation (below); indicating greater utilization is

PRODUCTION EXECUTIVE: Sherrod E. Skinner, vice-president and general manager of General Motors' Oldsmobile Division, who at 46 is charged with producing cannon and shells on a heretofore undreamed of scale.

Shift	APRIL		MAY		JUNE	
	Number Employees	Per Cent	Number Employees	Per Cent	Number Employees	Per Cent
1	195,671	58.9	226,742	57.9	216,388	56.3
2	93,772	28.3	114,849	29.3	110,781	28.8
3	42,591	12.8	50,212	12.8	56,984	14.9
Total	332,034	100.0	391,803	100.0	384,153	100.0

Tool Conservation begins in the Tool Crib

Photograph—Courtesy General Electric Company, Philadelphia

LONG, efficient tool life may be as much due to care in receiving, storing and handling in the Tool Crib as to proper use *out* on the job.

Here is an example of a carefully thought-out tool crib arrangement that pays substantial dividends to its plant in dollars and time saved. After use each Tap is carefully wiped clean of grit and chips before being restored to its proper place. The shank is placed in its individual recess, leaving the cutting edges free from chance blunting or chipping against other Taps.

This arrangement takes into consideration the size, shape and physical peculiarities of these tools to insure safety of storage, speed of locating and ease of handling.

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being made by the third, or "graveyard" shift.

From these figures, it is easily observed where the additional employment required to meet peak estimates will fit into the employment picture. Second and third shifts will be filled out as much as possible by the newcomers into jobs in these plants.

Reports were confirmed this week that the novel stainless steel airplane that has been under construction for many months at the Stout Engineering Laboratories, Inc., has been completed and test flights were successful. Ralph Smith, chief engineer at Stout, confirmed the report and stated that the ship would be ready for delivery to the Army within the next two weeks. However, certain CAA tests must be passed before the craft will be released. This ship, in its present form, is not a military type, but was designed chiefly for liaison or reconnaissance work. Its four wheel landing gear with the front two wheels under steering control and its low speed with fast climb make it particularly suitable for this type of work.

WHILE there has been considerable discussion about the Ford Willow Run bomber plant turning out a plane an hour, and at least one source reported that such production was now a reality, there has been nothing concrete upon which such ideas can be based. A spokesman at Ford definitely denied that any such production has been accomplished, stating that while a few ships have been completed, production is not near maximum. Furthermore, when the plant is in full operation, for every plane completely assembled ready for delivery from Willow Run, at least two will be shipped out to southern assembly plants in part form for assembling. These shipments, of course, must be included in the plane capacity estimates of the Ford plant, although they will not be assembled there.

Another milestone in the long road to production perfection was passed this week when Chrysler announced that a complete change-over in the model of war tanks built at the Chrysler tank arsenal had been made without any loss in production time. The last M-3 model rolled off the assembly line and was followed in short order by the first M-4 that has been made on an assembly line basis. To do this without loss in production time is no mean achievement, since model changes in the industry have always been accompanied by long periods of employee idleness. Such a change-over may easily be the beginning of thought along these lines for the future days of peace which are now but a wishful dream.

While such a change-over without lay-offs at Chrysler is a worthy accomplishment, naturally it could only have been done at a much greater expense than would be considered economically feasible in normal automobile production. Furthermore, other factors, such as government underwriting of some expense, duplicate assembly lines and greater availability of space, must be considered.

Chrysler, however, is not alone in such an achievement, since similar bouquets are in order at the Murray Corp. where it was announced that "between model" drops in employment will be negligible. Murray, changing over from production of parts for Consolidated bombers to those for the Thunderbolt pursuit ship, stated that the employment low would be reached in October, and then would only be about 8 per cent under the employment during June.

WHAT is one's loss is another's gain, and Washington certainly got the better end of the bargain this week when Ernest Kanzler was ordered there from Detroit to take over the job of deputy chairman of the WPB. His efforts as chief of the Automotive Branch of WPB, stationed in Detroit, drew nationwide attention, for it was his job to convert the industry to war production.

As Alvan Macauley, Packard Motor Co.'s chairman as well as the Automotive Council for War Production's president, said, "The appointment of Ernest Kanzler as deputy chairman of the WPB is a signal recognition for a job well done." This attitude is general throughout the industry, and best wishes travel with him in his larger assignment.

While personnel training courses are not new in the automotive industry, training the Army and Navy certainly is a variation of this procedure. The first group of Army men to complete the new General Motors war vehicle training course has just finished an intensive two-week training period. This class consisted of 30 non-commissioned Army Ordnance officers, and their training was designed to familiarize them with the design, service details, and maintenance of all parts and assemblies of the famous General Motors 6x6 military truck. Instructors have been drawn from the company's service organization, and school facilities occupy about 10,000 sq. ft. of floor space.

Meanwhile, W. P. Brown, president of Briggs Mfg. Co., stated that an aeronautical equipment maintenance school was being opened at the Briggs plant under the auspices of the company.

The little publicized part that automotive engineering departments are playing in the production of better weapons at less cost is exemplified in at least one instance by activities of Pontiac Motor engineers. From the start of the Oerlikon gun project it was generally known that the gun was not designed for mass production, almost every part giving evidence of restricted, hand-made, tool room methods. Recognizing this strategic weakness, engineers working with production men, set about simplifying production processes and re-designing time consuming parts.

While military rules forbid detailed description of what has been done, several examples will show how these highly complicated weapons were simplified. A formerly forged part that was finished all over is now made of heavy steel stampings and finished only where it fits other parts. This change reduced the number of machine operations from 29 to 15, released one-third of the machine tools formerly required for other work, saved about 2500 lb. of steel per month, and substantially reduced the cost of the finished part.

Another part, originally designed and made from a solid alloy steel forging, is now made of two parts welded together. This assembling method saves three hours of machining time per part, 25 tons of now-scarce alloy steel per month.

McKee engineering produces

RECORD-BREAKING PERFORMANCE

BACK in 1931 a world's record for pig iron production was established with 41,701 tons in one month. This record went unchallenged for almost 11 years.

With the Iron and Steel Industry building and producing for Victory, the old record has been broken three times in 1942. First, in January with 41,782 tons . . . again in March with 43,478 tons . . . and again in May with 43,866 tons—the present world's record.

Each of these record-breaking performances was achieved by a different blast furnace—and each plant was designed and built by McKee.

The March record included production of *1608 tons in a single day*—more than the weight of 50 medium tanks—to establish a new world's record for one day's production.

This is factual evidence of the important role the McKee organization is playing in the Iron and Steel Industry's war effort—and of the value of McKee engineering to that effort.

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Washington . . .

• Facilities staff of WPB helps find plant capacity, and assists in other ways . . . It forestalled the building of a huge magnesium foundry and split the work among gray iron foundries.

WASHINGTON — Industrial engineering advice is being furnished by WPB's Facilities Staff to military procurement officers, particularly to the air force. Whenever a loss of production time threatens on account of lack of plant capacity, WPB men attempt to find facilities to meet them.

Likewise the Facilities Staff has helped remedy the money loss of labor and management, suffered in industries whose products may no longer be made because of war needs. WPB industrial specialists on the Facilities Staff have been laboring to match Army, Navy and Maritime Commission requirements with existing plants and equipment. With no fanfare, these men have been surveying plants and helping them to shift over to munitions production, to save millions of dollars and tons of raw material which would otherwise have been expended in building new factories. Thousands of workmen, too, now hold their jobs because WPB and the erstwhile civilian industries are effectively augmenting military manufacturing.

However, the staff does not concern itself with aid to manufacturers in the actual negotiation of war contracts. That is the work of contract distribution officials.

It has been found that not all factories can handle war contracts. Some must be turned down because they are not financially responsible, or cannot be economically operated. Some machinery cannot be used because it is not suitable for any type of process except that for which it was originally designed. Other factories have inferior machinery, or outmoded equipment, or serious lack of plant or storage space. These types of factories, sadly enough, must of necessity be industrial casualties.

WPB cannot permit the continued consumption of metals for civilian use, where it has been determined to be non-essential. Therefore, the non-convertible factories are closed down, and men deprived of employment, with a consequent but unavoidable loss to individual communities and to the country at large.

However, the picture has its brighter side. Millions of dollars worth of war goods are now being produced by factories which formerly made civilian articles. The warm air furnace, temperature and combustion control, typewriter, office machinery, bicycle, jeweled watch and the farm machinery industries have made notable contributions. But of course, there are still factories which could be converted but have not been because of lack of initiative on their own part in getting into the war program. There are other suitable factories which WPB's efforts have not reached.

Concentration of industry, with a view to use the facilities of the plants which do not produce non-military essential goods for war output is proceeding slowly. There is no doubt, in the opinion of private economists in Washington, that the sensible WPB policy of permitting some civilian industries to use up inventories of processed materials has retarded conversion though it has lessened very serious financial repercussions throughout the country.

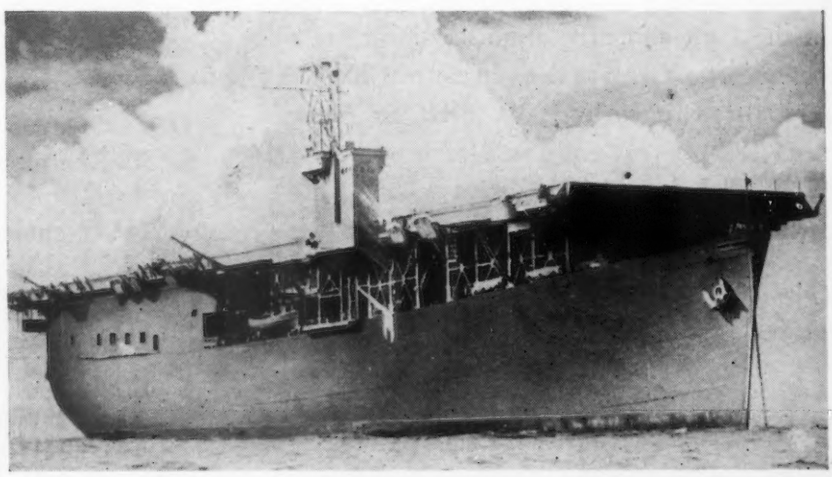
THE Facilities Staff has been able to meet the aircraft industry's demand for capacity to make magnesium castings by forestalling the building of a $14,000,000 foundry and substituting about 20 gray iron foundries for this purpose.

The foundries selected by WPB and agreed to by Air Force procurement officers were of a type having the necessary space and equipment. Each of them have had to be thoroughly cleaned to remove all traces of iron. Sand in the foundries has had to be cleaned or replaced. Exact temperature controls have to be maintained because magnesium castings are rejected if there is a variance of 2 deg. at a given stage in heating the metal.

Some idea of the extent retooling and plant rearrangement which has occurred is illustrated by the following examples of industries which have been converted:

Warm Air Furnace—This indus-

CONVERTED MERCHANTMAN: In one of the first pictures of this type of craft ever released, the Navy shows the manner in which merchant ships are being converted to aircraft carriers.



WAR PRODUCTION—33½ HOURS PER DAY!

SUNOCO EMULSIFYING CUTTING OIL

increased output 40%...stepped up tool life...improved finish

It takes bullets to win battles, and American ingenuity is finding ways to set amazing records in the race for arms production.

For example, in a plant turning out bullet-assembling machines, excess heat on tools and work, poor finish, and operators' skin complaints were restricting production. A Sun Oil Engineer — one of those capable Doctors of Industry — was called in to improve conditions. He recommended a change in cutting fluid . . . to Sunoco Emulsifying Cutting Oil. Now they're using Sunoco . . . and rate of production has increased 40% — equivalent to an extra 9½ hour shift every day! Finish has also improved, and skin trouble vanished.

Sun Doctors of Industry and Sunoco Emulsifying Cutting Oil stand ready . . . willing . . . and able to help you step up production in your shop. For helpful case histories of what they have accomplished for other leaders in the metal working industry, write for your free copy of "Helping Industry Help America."

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try is producing ammunition boxes; shell washing equipment; gun powder mixing tables; parts for life boats; ballistic testing equipment; parts for destroyers; welding equipment; radio equipment; aircraft parachute flares; airplane strut parts; armor plate; tank parts; 100-lb. bomb cluster adapters; grates for Army stoves; materials for shipbuilding; 20 mm. ammunition box liners; U. S. No. 20 cannon stoves; universal joints for Navy guns; truck battery boxes and tanks; bomb fuzes and sheet and plate construction for ammunition plants.

THE industry is devoted approximately 20 per cent to war work, and is using its screw machines in the production of the foregoing articles. Forging machines which have been used have been converted to the production of 40 mm. shell forgings. The carburizing of steel which is quite foreign to the Warm Air industry has been successfully accomplished. Nearly all of the work is on a subcontract basis due to the inability of the manufacturers to obtain prime contracts. There are 166 firms in this group and from 25,000 to 30,000 employees. The value of the 1941 output was nearly $35,000,000.

Temperature and Combustion Control—The 138 concerns in this industry have war work which is equal to 250 per cent of 1941 production value and are producing precision equipment for military use such as controls, thermostats, and other automatic devices. In 1941 the value of the industry's production was $44,000,000.

Typewriters—This industry has been recently concentrated in the plants of the Woodstock Co. But latest conversion reports show that a flood of 30 caliber ammunition, carbines, 40-mm. projectiles, percussion primers, fuzes and rifles are pouring out of the plants of the six main companies. WPB reports that contracts on hand are equal to 250 per cent of the value of 1941 gross sales which amounted to $85,000,000.

OTHER Office Machinery—The 65 companies in this industry which produced $243,000,000 worth of goods in 1941 with their 50,000 employees are making anti-aircraft guns, range finders, sound detectors, gun mounts, bomb fuzes and primers, aircraft parts, ammunition over 60 caliber, etc. The companies say that contracts on hand are 90 per cent of 1941 sales.

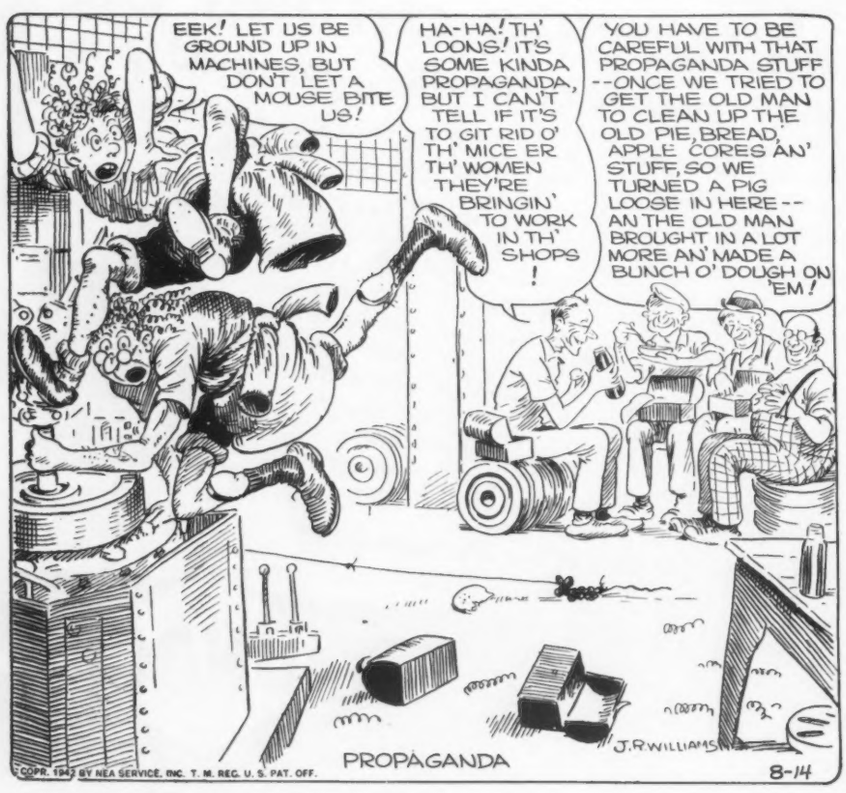
Jeweled Watch—Perhaps one of the most important phases of the whole conversion program and one in which WPB has been particularly active and successful is the changeover to war material production by the watchmakers. The similarity in the skills of precision aircraft instrument makers and watchmakers is so close that watch manufacturers are able to meet the demand for a multitude of delicate instruments so necessary in a mechanized war. Time fuzes and directional finders and tank and submarine instruments are a few of the products of this industry. The five companies are about 80 per cent on war work and the total value of 1941 output was approximately $54,000,000.

Bicycles — It is expected that since the industry is to be concentrated by WPB the 50 per cent conversion which the industry new reports will rise much higher. The bicycle industry is making shells, bombs, fuzes, gun carriages, shell adapters, bayonet scabbards, airplane parts, truck rims, bases for solid tires and small arms. The annual business in 1941 amounted to $45,000,000 and was participated in by 12 companies.

Farm Machinery — Tanks, anti-aircraft gun parts; aircraft parts; ammunition; gun mounts; tractors; half truck combat cars; wood truck bodies; armor piercing shot; crawler type tank repair units; trucks; torpedoes; shell forgings; pontoons; oil purifiers; gun parts; fuzes; incendiary bombs; packing crates for bombs; mooring buoys; mesh wire; conveyor belts; precision gages; decontamination assemblies; gears and shafts, are the military products which represent the 110 per cent conversion of this industry. The 800 firms which produced $734,000,000 worth of goods in 1941 have 90,000 employees.

The WPB Statistics Division making monthly surveys of the rate of conversion makes its information available to the Facilities Staff which can tell from these figures whether a given industry or plant within the industry is capable of being adapted to military requirements. The Facilities Staff also coordinates its activities with those of the Plant Site Board, and in this way heads off the construction of new munition works, where existing facilities are available.

THE BULL OF THE WOODS — BY J. R. WILLIAMS


EEK! LET US BE GROUND UP IN MACHINES, BUT DON'T LET A MOUSE BITE US!
HA-HA! TH' LOONS! IT'S SOME KINDA PROPAGANDA, BUT I CAN'T TELL IF IT'S TO GIT RID O' TH' MICE ER TH' WOMEN THEY'RE BRINGIN' TO WORK IN TH' SHOPS!
YOU HAVE TO BE CAREFUL WITH THAT PROPAGANDA STUFF --ONCE WE TRIED TO GET THE OLD MAN TO CLEAN UP THE OLD PIE, BREAD, APPLE CORES AN' STUFF, SO WE TURNED A PIG LOOSE IN HERE -- AN THE OLD MAN BROUGHT IN A LOT MORE AN' MADE A BUNCH O' DOUGH ON 'EM!
PROPAGANDA
J.R.WILLIAMS
8-14
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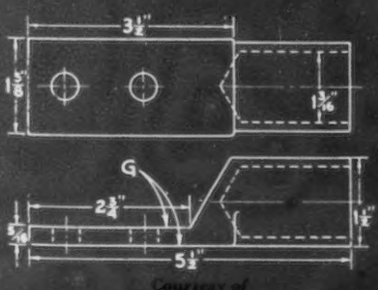

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CAMBRIDGE, MASS.

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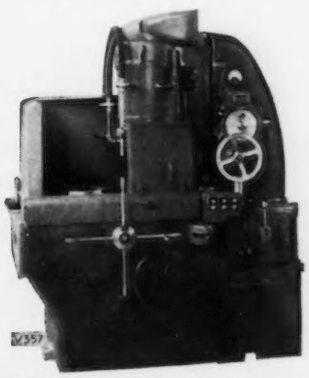
Both sides of the castings are ground to clean up — to close limits for parallelism. The floor to floor time is less than two minutes each.

This is a good example of work with a projecting surface that can be ground to advantage on a Blanchard. This is accomplished by mounting the lugs in the fixtures with the round end toward the center of the chuck. The chuck is moved under the wheel to the proper depth and then the wheel is fed down until all the surfaces on one side are ground clean. The same method is used for grinding the surfaces on the other side.

Whether your work requires fine finish or extreme accuracy — whether it requires light finishing cuts or hogging cuts, the Blanchard No. 11 will do the job quickly and economically.



Blanchard No. 11 Surface Grinder

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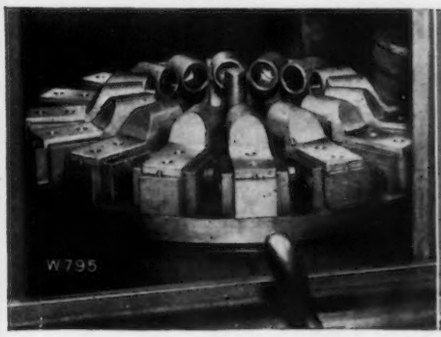
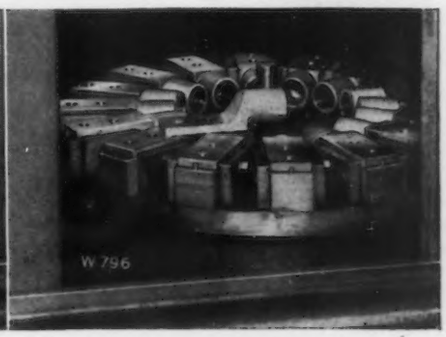


Grinding offset side of lugs



Grinding flat side of lugs

WEST COAST . . .

• Sufficient gas for proposed sponge iron industry probably unavailable . . . Shippers scurrying to organize non-profit groups . . . Gain in productive efficiency at shipyards attributed to good morale and supervision.

LOS ANGELES—Lost in the labyrinth of technical data being offered by proponents of sponge iron as the solution to the steel industry's basic material worries is a factor in kindergarten economics which may nullify whatever victories laboratory geniuses have scored in their test tubes.

In the years that sponge iron has been a dormant controversy in the East, coals of the issue have been kept alive on the Pacific Coast. Despite the yearnings of local chambers of commerce, the Pacific Coast has never had a blast furnace for the simple reason that no one had ever discovered any coking coal deposits considered adequate by the industry. Lack of coking coal was no barrier to sponge iron processes based upon the use of natural gas as a reducing agent, and consequently these processes have been urged at great length as the salvation of a geographical region which had sunshine, movie stars, airplane factories and shipyards but hung its head for lack of an iron industry. The irony of this ironless economic island has been the presence of substantial iron ore deposits.

Encouraged by the proddings of the Bureau of Mines, advocates of sponge iron production with natural gas now have promoted themselves from the local to the national limelight. Insofar as California is concerned the natural gas iron ore reduction school has, by and large, accepted the theory that inasmuch as ample gas could be secured to conduct laboratory experiments by turning on a jet, it followed that if the experiment were transformed to commercial production sufficient gas could be secured merely by tapping the nearest gas main. Most California cities rely on natural gas as the common industrial and domestic fuel. Reared in a land of abundance, and influenced by conservation measures restricting the waste of natural gas in petroleum producing regions of the state, it is only natural that sponge iron technicians should base their processes on the theory that an oversupply of natural gas existed in the state.

PERHAPS, before national defense quickened the state's industrial halt, natural gas was going begging. Currently, however, it is highly doubtful if present production and transportation facilities could supply sufficient gas for a sponge iron industry as large as has been proposed in the public prints. If expansion of gas production and transportation facilities were to be required for setting up sponge iron plants on a grand scale, including pipelines using vital steel, the case for sponge iron as the solution of the nation's war emergency aches would be substantially weakened.

Now weak for the same reason —the growing appetite of coast industry—are arguments for iron ore reduction in the electric furnace, often proposed as ideally suited to the coast because of huge government hydro-electric projects here. In the days when political sponsors of these projects had deep-seated fears that their kilowatts would be a drug on the market, much hope was placed in the possibility that an electric furnace iron industry could be nurtured. Now, the dam builders are panting to provide power as fast as aluminum plants, aircraft factories, shipyards and other big consuming industries are being expanded to lap it up.

Still another proposal to help the coast overcome its lack of coking coal, and one that may hold eventual promise, involved a modified process by which the manufacture of petroleum coke from refinery residues would be carried further to produce a strong, pure coke of metallurgical grade. A relatively short time ago ample refinery residues were available. Now, some 80,000 tons will be converted to meet the carbon demands of the aluminum industry which, coupled with a vastly increased demand for fuel oil and an excess supply of gasoline, will sew up the future of the petroleum coke industry for sometime to come.

Thus, windmills spring up on all sides to give battle to coast Quixotes who hope to solve a basic material shortage by mere substitution of new methods.

•

RECENT federal legislation regulating rates and practices of freight forwarding companies and consolidators and placing them under Interstate Commerce Com-

HAND THAT ROCKS THE CRADLE: Miss Constance Walker, tool designer for Douglas Aircraft, is typical of the growing army of women aircraft workers. Among Miss Walker's duties is the designing of airplane jigs or "cradles."

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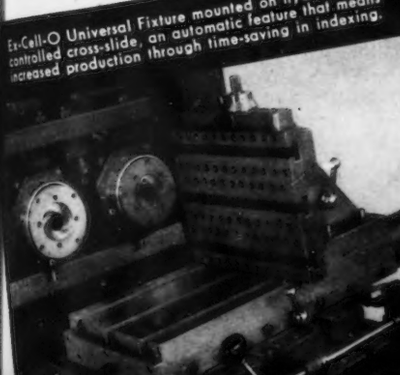
...sion boring and facing airplane engine part, with ...ionship between shoulders and flange rigidly held ...Junior Double End Machine . . . with Ex-Cell-O Universal Fixture.

...sion boring Diesel part for U. S. Navy, holding ...er bore concentric with O. D. and six other holes—Junior Single End Machine . . . with Ex-Cell-O Universal Fixture.

...sion boring aircraft part to limits of ±.0002" and ...ding distance between large and small holes to ...me exactness—on Junior Single End Machine . . . with Ex-Cell-O Universal Fixture.

...sion finish boring machine tool part, with 11½" ...gth hole kept parallel to base and dovetail—on ...avy Duty Double End Machine . . . with Ex-Cell-O Universal Fixture.



Ex-Cell-O Universal Fixture mounted on hydraulically controlled cross-slide, an automatic feature that means increased production through time-saving in indexing.

mission regulation has caused a minor revolution in the handling of less-than-carload shipments from the East and Midwest to the Pacific Coast. Recently, withdrawal of inter-coastal cargo vessels and consequent growth of rail freight shipments has spawned a sizable colony of opportunists in the freight forwarding field with consequent disruptive effect upon rates and trade practices.

One section of the new legislation exempts large individual shippers, organized groups of shippers and non-profit associations from its provisions. Therefore, shippers are scurrying to organize such non-profit groups and associations on a patronage dividend or share-the-expense basis in order to avoid increased freight consolidating charges. Aircraft plants in Southern California alone are estimated to have been shipping six million pounds l.c.l. per month by one contract forwarding company and henceforth will route this freight through a non-profit organization within the industry. Hardware, metal and industrial supply houses in California authoritatively are reported to ship about three million pounds per month l.c.l., and there is now being discussed the possibility of a cooperative arrangement to effect economies under the new legislation.

Reducing to statistics a dramatic increase in productivity of management and labor, records of California Shipbuilding Corp., Los Angeles Harbor, show that that yard's 50th EC-2 Maritime Commission cargo vessel, recently delivered, required only 52 per cent as many man-hours as the first four vessels of this series built there. The Calship yard, with eight ways and six outfitting docks, was constructed from scratch during 1941 on a blue print contemplating the most efficient possible production of this particular type of vessel. Actual ship construction started at the yard little more than 10 months ago, and the first hull was launched last Sept. 27. Since, total average production per man-hour at Calship has doubled. Tonnage through the plate shop per man-hour has trebled. Steel erected, per man-hour, is two and a half times what it was at the start. Manual welding on the ways is three times as productive, per man-hour, as it was Jan. 1.

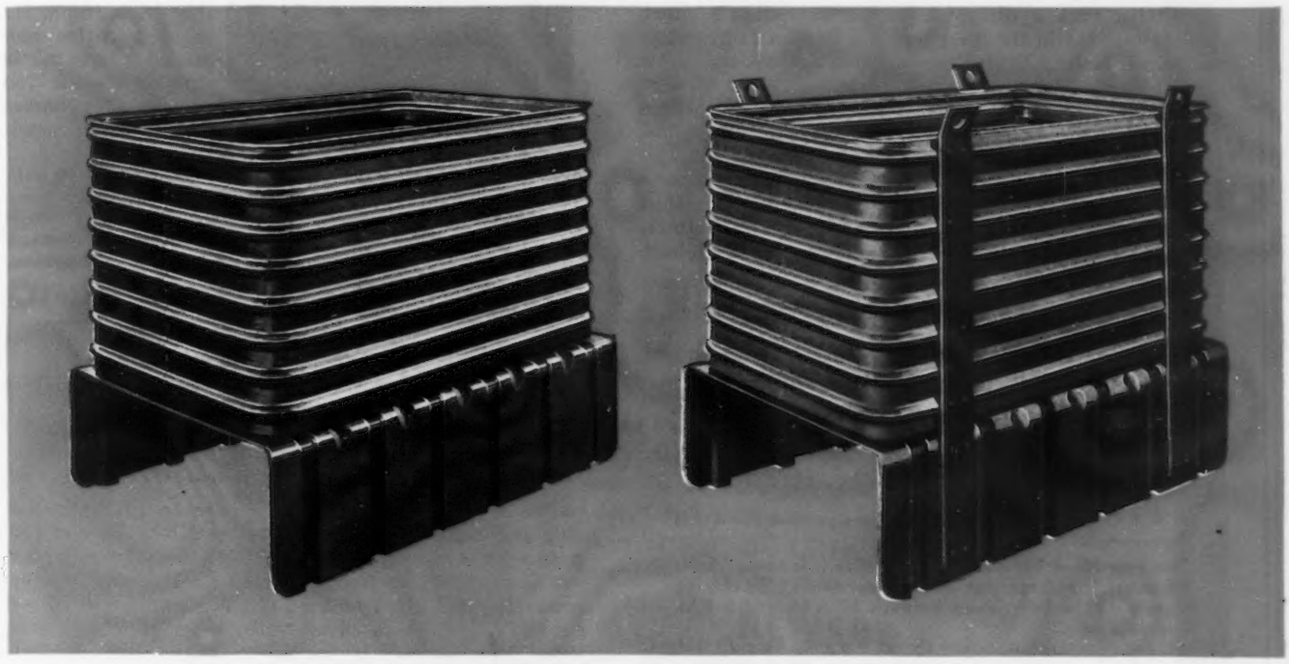
Company officials attribute this remarkable gain in productive efficiency to excellent morale in the labor force as well as to efficient administration and superintendence. Indicative of this fine morale is a current absenteeism in the yard of from 4½ to 6½ per cent, compared with a normal shipbuilding average of 6 to 8 per cent. Facilities are utilized to their maximum with operations on a three shift basis, seven days a week, with full crews on all shifts. This pace is reduced only when and if deliveries of materials or departmental production becomes irregular or imperfectly synchronized. In one recent hectic month, 15 ships slid down the ways, but this speed is being leveled off to coincide with material deliveries.

FLYING FORTRESS GUNNER: Sgt. William Ewing inspects the ammunition belts which feed the side guns of a Flying Fortress before taking off from a British air field. He also acts as assistant radio operator when the plane is not under attack.

RECRUITING and training of efficient labor crews in the shipyards has not been without repercussions in other heavy industry, however. The average shipyard worker in California drew a $54.57 weekly pay check in June. The average iron and steel foundry worker received only $43.97 per week. This spread is one of the principal reasons why a typical, well-managed foundry, Los Angeles Steel Castings Co., reports a labor turnover of 16 per cent per month for its entire crew, and a complete monthly labor turnover in its common labor force. Of this firm's 500 workers, Monday absenteeism runs regularly from 30 to 40, largely among unskilled Mexican and Negro workers employed to fill the ranks. Although weekly earnings of the average worker at this plant are 80 per cent higher than in January, 1939, and actual hourly wages are up from 20 to 40 per cent, including up-grading, increased wage demands will be arbitrated by the War Labor Board with every prospect of a still higher scale.

A New Word to Add to Your Industrial Dictionary

TRUSCONVEY



and here's what it means to you

More efficient storage of parts and materials, at strategic points throughout your plant!

More efficient movement and delivery of this material to production lines!

You secure these cost-reducing advantages when you use Truscon Steel Boxes and Skid Platforms to TRUS*CONVEY* anything that involves moving operations in your plant. These sturdy, long-lasting Truscon units are designed to meet the particular requirements of each individual material handling job. They can solve a wide variety of handling problems, simplifying operations, speeding production, encouraging profits.

Learn to say TRUS*CONVEY*—learn the many benefits you will receive from Truscon Steel Boxes and Skid Platforms—let us study handling conditions in your plant and make well-planned recommendations without obligation. Write us today.

Investigate TRUSCON Foundry Flasks

Light weight . . . durability . . . strength where strength is needed . . . easily rammed and shaken out . . . these are features of economy and production you get in TRUSCON foundry flasks.

Write for descriptive literature on complete line.

Truscon

MATERIALS HANDLING EQUIPMENT

Truscon Steel Co., Pressed Steel Division, 6100 Truscon Avenue, Cleveland, Ohio. Subsidiary of Republic Steel Corporation.

YOU'LL FIND IT WILL PAY TO *TRUSCONVEY* YOUR PLANT MATERIALS

Fatigue Cracks BY A. H. DIX

Ryan Rave

• • • Tom Ryan, the St. Louis division of this page's army of eighteen readers, writes enthusiastically that he thinks most of what we print is passable, and some of it is even pretty good, with the exception of the blurbs, which leave him cold.

We feel the same way about them, recalling Emerson's "What you are shouts so loud that I cannot hear what you say." Furthermore, the brains department is hitting such a dizzy pace these days that a blurb is like blowing in the direction of a P-40 in full throttle to help it along. Still, Emerson insisted that the towns in which he lectured be well placarded. So, to keep our hand in, we will continue to exhibit, from time to time, donated bouquets and home-grown nasturtiums.

Blurb

• • • Our favorite flowers are the modest violets that bloom casually at the tail end of line-of-duty letters. For instance, Lorin E. Combs, chief inspector of Hobart Manufacturing's Dayton Scale Division, postcripts:

> "I might add that your family journal is a great help in times like these."

And a Borg-Warner plant adds this after-thought to a request for routing slips:

> "You will see that there are fourteen names on the slip. This compares with an average of seven names on the fourteen other paid publications we receive."

Turnabout

> • • • One has the most peculiar dreams these hot nights For example:
>
> The door of an important-looking office is lettered "Sales Manager." A large sign on the door reads, "Purchasing agents will be interviewed between 10 A.M. and 3 P.M. Tuesdays only."
>
> —*Perry Morgan, Vice President, Melrath Supply & Gasket Co., Philadelphia*

That's not a dream. It is merely a mild nocturnal exaggeration of a fact.

Corpse Dies

MUNICH PACT DEAD, SAYS EDEN

—*N. Y. World-Telegram Headline*

No surprise to us. For the last year or so it hasn't seemed to be its old self.

Poured Beams

> • • • I just want to make sure that someone kids you a bit about the gem on page 124 of the July 16 issue. A "structural steel foundry" must be quite a place.
>
> —*R. W. Parsons, Engineering Dept., Ohio Brass Co.*

Indeed it is. Next to filling a straight flush with an inside draw, there is no more inspiring sight than the pouring of a 24-in. I beam.

Cockeyed Liar

• • • We are trying to get in touch with E. H. Nelson. All we know about him is that he is connected with a Royal Oak, Mich. company, as a form letter we sent out was returned by him with that postmark.

The letter offered to send an article telling how cutting tool life has been increased as much as nineteenfold by the Wright Aeronautical people. He returned the letter with the notation, "I think you're a cockeyed liar, but send it—let's see."

Our eyes toe in only the normal amount; and as for the noun, the article is the first one in the July 23 issue, "*Fine Tool Finish Increases Tool Life 2000 Per Cent.*"

This article and others on tool steel saving have been reprinted in a 28-page booklet, "*How to Increase Cutting Tool Life.*" Twenty cents in stamps or two dimes sent to us at 100 E. 42nd St., New York, will get you a copy.

Altitudinarian

• • • Your favorite family journal's technical editor, Frank Oliver, took this photograph. He is on vacation and mailed it in to us. It isn't his hospice. The sameness of names is merely a coincidence.

Where the drunkless haven is he doesn't say, but it is probably some place in the Adirondacks. He climbs mountains.

Prize Slogans

• • • The Office of War Information has mulled over thousands of slogans, and among the twenty-one selected as representative are these:

Produce! Produce! Produce! And Cook the Axis Goose.

Not Defense—But Over the Fence and At 'Em.

Come on Boys, Let's Go. With Peak Production, We'll Show, How to Eliminate Tokio.

The first is our favorite for use in all but New England plants, where *produce* would be pronounced prod-yewse, ruining the rhyme. We are now roughing out a specialty for Brooklyn plants. It begins, "Keep production a-berlin', and. . . ." To complete it all we need is something to rhyme with "a-berlin'." The first thought, of course, is the name of the Nazi capital, but it won't do, as it is r-less in Leo (Lippy) Durocher's parish.

Felicitous Phrasing

• • • Which reminds us to quote this phrase in a recent IRON AGE article on 20 mm. shell manufacture:

> • • • yet this was enough to cause the die head segments to pull the band out into a shape resembling a Ubangi lip.

We hope St. Peter is keeping a close eye on the play these days, so that his scoreboard will duly record the pioneer work the brains department is doing in raising the blood count of technical writing. It need not be, as your f.f.j. is demonstrating to you, as colorless as something that lives under a rock.

Aptronym

> • • • Richard M. Dodo is manager of the Dodo Mortuary, Hilo, Hawaii.
>
> —*R. A. Ness, Asst. Sales Manager, J. D. Wallace & Co., Chicago*

It's Sedna

• • • *Recently we acknowledged a contribution from Miss Selma Boyle. It's Sedna, not Selma. Sorry.*

Puzzles

• • • Last week's answers are one or —2.

We don't know the answer to this one, but if one of the master minds will air mail the solution to us we will get it in time to publish it in next week's issue:

Every second a cubic centimeter of milk drops from a container holding one liter (1000 cc.). In the intervals between drops a cubic centimeter of water drips into the milk. When will there be a 50-50 mixture? Assume instant dispersion.

WANTED!
THE RETURN OF
HIGH-SPEED STEEL SCRAP
Believed in hiding in America's vital industrial plants. Description—aged, worn or broken down. To be returned and drafted "in the service." This notice addressed to all users and makers of high-speed steel tools interested in apprehending this slacker.
REWARD
The satisfaction of knowing you are doing your bit to relieve high-speed steel shortage

YOUR TOOL STEEL MAKER *needs your* HIGH SPEED STEEL SCRAP

★

5

- The growing scarcity of steel scrap must not be allowed to hamper America's war effort. The necessity for its prompt salvage is therefore self-evident! Especially is this true of high speed steel, since its high Vanadium content is of such vital importance.

Latrobe is using this space to urge all tool steel users and manufacturers of tools to make every effort to return to your tool steel producer all such scrap. You will help yourself as well as our country by your prompt cooperation.

LATROBE

ELECTRIC STEEL COMPANY

LESCO

MAIN OFFICES *and* PLANT • LATROBE • PA•

Dear Editor:

SCRAPPIES

Sir:

I have a pre-release copy of an editorial from the Waste Trade Journal which quotes from THE IRON AGE as follows:

> "The nation's scrap iron problem is blundering along to a first class crisis this winter, which will jeopardize a sizable chunk of the war program. The psychology of the junkman has been ignored from the beginning of the war program. The scrappies' prices have long been frozen both horizontally and vertically. He is off-pace from excessive supervision, twitchy from government threats and suits, and discouraged by amateurs talking nonsense. The scrap collector is therefore going out and getting a defense job, and at the same time, the only organization that can properly turn in a satisfactory performance is slowly disintegrating."

I have looked through THE IRON AGE and cannot find this quotation. It so precisely expresses the situation in the most clear cut English imaginable that I am wondering in what issue it is and if it is not, why,

J. E. JACOBSON,
District Manager,
Luria Brothers & Co., Inc.
Pittsburgh

• This paragraph was intended to appear in "This Industrial Week" in our July 23 issue, but was omitted, due to space limitations. It did appear as part of a press release sent to newspapers.—Ed.

OLD LATHE

Sir:

The vocational school of the Clovis High School Training War Workers has a turret lathe of some years back manufactured by Lodge and Davis Machine Tool Co., Cincinnati. We would appreciate it if you would advise who has taken over Lodge & Davis, information that will be of value to us in rebuilding this machine for service.

CARL A. MILLER,
Local Director of National Defense Training,
Clovis High School,
Clovis, N. M.

• No one at present is carrying on this line and it will be impossible, probably, for you to pick up parts. Lodge & Shipley Machine Tool Co., Cincinnati, is an offshoot of the old Lodge & Davis company but has not made a turret lathe for the past twenty-five years.—Ed.

ARSENAL PICTURES

Sir:

Some time ago photographers visited this Arsenal to take pictures of certain of our products, some of which appeared on page 81 of the July 16 issue. As you know, it is exceedingly difficult for an army officer to get his hands on money, and our library refuses to allow me to mutilate its copy of THE IRON AGE by cutting our photographs.

Would you, out of the goodness of your heart, be kind enough to send me a tear-sheet or used copy of your periodical giving me page 81 of the July 16 issue?

LAWRENCE PRIDDY, JR.,
Capt., Ordnance Department,
Public Relations Officer,
Watertown Arsenal,
Watertown, Mass.

• Out of the goodness of our heart, we are sending you six.—Ed.

GERMAN SPECIFICATIONS

Sir:

In your issue of May 28, I noticed on page 78 that somebody is in need of the latest German steel specifications. I happen to have a complete list of the latest German specifications (until 1939 and 1940) regarding steel, aluminum, and magnesium alloys. If it should be of any value, I will gladly copy the DIN specifications which are asked for, and send them to you.

WOLF FLATOW,
Spokane, Wash.

• Don't go to the trouble and expense of copying them. We are asking Otto Guttmann, who sent in the original inquiry, if he wants photostats.—Ed.

BULL

Sir:

I have been greatly impressed and amused by the series of industrial cartoons appearing in issues of THE IRON AGE. I refer to the series entitled, "The Bull of The Woods," by the cartoonist, J. R. Williams.

Anyone working in a shop can vouch for the true to life quality and sincerity of Mr. Williams' illustrations. I wonder if you have reproductions of any of the cartoons in this series suitable for framing? I would like to use them for decorative purposes in my small basement shop.

EDWIN DREWITZ,
Woodside, L. I.

• These cartoons are syndicated and we understand they are available only in the form in which they appear in THE IRON AGE.—Ed.

GUIDE

Sir:

Yesterday, while in conference with one of the officials of the Priorities Office, I had the good fortune to be shown your Priorities Guide, and we used it a few times for reference. The official told me that it was in his opinion one of the best in the field today. I would apreciate it if you would forward a copy to me and bill me for the cost of it.

DAVID J. SULLIVAN,
Webster, Mass.

CIVILIAN STEEL

Sir:

Granting the fact that practically 100 per cent of the steel capacity of the country is being used for war purposes, is there anything to the thought that a substantial amount of the raw steel is not getting through into finished weapons? Upon my recent plant visits I have seen tremendous amounts of steel and steel products in process. Do you know of any measure of the amount of steel that is thus occupied?

I cannot help but think that if the steel-making capacity of the country is thriftily utilized that there would be enough to maintain a substantial number of the industries serving the civilian market.

HORACE N. GILBERT,
Harvard University,
Boston, Mass.

• Only a very small percentage of steel production actually goes into war weapons; in fact, a preliminary breakdown of where steel will go in 1943 shows that just about one-half will be for direct prosecution of the war and the remaining half will be split as equitably as possible among various civilian industries pertaining to the war effort. This latter category is almost infinite in scope, and that is where all the trouble originates. Nonetheless, we believe that irrespective of the steel capacity of the country, the pace of the war is so fast and so demanding on us that we cannot conceive of any steel being available before the war's end for any product other than what is absolutely imperative to keep civilian life going and for what is absolutely necessary for the prosecution of the war.—Ed.

HIGH SPEED TIPS

Sir:

Will you please forward us a copy of April 16 issue? We are interested in the article entitled "High Speed Steel Tips Cemented to Low Alloy Shanks" which we have been advised by the St. Louis Ordnance District is contained in this issue.

ROWLAND RIEHL,
Davis Boring Tool Division,
St. Louis

ALUMINUM CASTINGS

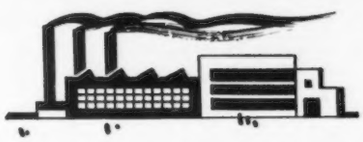
Sir:

We are compiling the material for our 1942 Foundry Industry Symposium. Mr. N. E. Woldman, of Bendix Aviation Corp., has submitted to us a copy of an article on "Aluminum Castings for Aircraft," which appeared in your publication, and we are writing to ask if you will give us permission to use this paper in our report.

JOHN J. MURRAY,
Consolidated Reporting Co.,
New York

• Granted.—Ed.

DO YOU NEED A SUB-CONTRACTOR?



Could you use another plant—completely staffed—for your war business?

Hundreds of manufacturers well equipped to work on sub-contracts, for war purposes have filed with us a complete listing of their facilities. Some are large, some small. We are in constant touch with them.

For example, many have mechanical and hydraulic draw presses, boring mills and milling machines, grinders, drill presses, screw machines, lathes, planers, shapers, and broachers. There are punch presses by the hundreds and all types of welding, forming and riveting equipment. Nearly all the manufacturers have some kind of finishing equipment.

Expert designers and production men in these plants are ready to assist you. Many have redesigned heavy, costly castings and forgings to stampings that are produced faster and conserve critical war materials.

Can you use the sub-contracting services of one of these well-equipped plants—now or on war work you are planning? Let us introduce you. Just tell us what kind of job you want done. We'll do the rest. Write The American Rolling Mill Company, 2681 Curtis St., Middletown, Ohio.

* * *

Are you looking for war work? Write for a copy of the ARMCO booklet: "Suggestions for Obtaining War Contracts." It may help you land the job you want.

This Industrial Week . . .

- ***Ratings on Orders Moved Up in Bulk***
- ***New List of NE Steels Developed***
- ***Useful "Junkie" May Be Assisted***
- ***Army Restrained From Using Plates***

AMID mounting confusion over the priorities system, causing further unbalance in the materials distribution setup, the metals and metal working industries this week continued their struggle to vanquish impossibilites and to bypass bottlenecks. Too many of the new AA super-ratings were being loaded into the steel industry's hopper, indicating that their importance would decline in the same manner as preceding ratings which appeared high when issued but turned out to be rubber checks.

In one recent action alone, thousands of tons of steel for warehouses were advanced to AA-3, putting the jobbers in a preferred position temporarily at least.

They deserve high standing on most requirements because of the important role they are playing in assisting completion of war equipment, but similar priorities action on several other occasions showed that only short-lived benefit accrued to the holder of the newly advanced rating.

Many other orders were being re-rated this week to a higher level, with the result that A-1-a standing began to be no more helpful in obtaining steel than was A-10 a month ago. One steel executive reported that about seven out of ten A-1-a orders on his company's books had been given AA-1 ratings by Washington.

Of course, in the process of marking up large blocks of ratings, some orders no longer deserving of high rank are allowed to languish. On mill books there are many of these orders, for steel no longer urgently desired by the consumer who may have deliberately overordered or duplicated his order or purchased merely to replace stock at his plant.

•

STILL more changes are coming in the priority setup, some of them bound to increase the heavy load of paper work burdening all industries. For the first quarter of 1943, WPB is understood to be planning to put the production requirements plan on a product basis, which means that if a manufacturer is making 10 products, he will have to file 10 priority applications. The objective is raw materials bills for products, so that WPB can keep closer tab on the situation. A further reason is that controversies are breaking out over the proper processing of PD-25-A forms. Priority Regulation No. 10 is being revised and the name of the system changed to the production code.

At the same time an experiment will be conducted in production and material control in selected industries through a brand new system known as the contract production control which, if successful, would eliminate the PRP plan and with it priority ratings. Instead of a manufacturer making application for materials which no one knows whether he needs or not, raw material bills would be compared against individual contract requirements.

Steel experts are firm in their belief that the job of scheduling steel production back in the mills may become easier if the new quota system is given a good trial and not interfered with. WPB is attempting to have additional men from various steel companies join the WPB in order to help put through the mechanical operations of the quota system.

A new and more complete list of National Emergency alloy steels has been developed, designed to save additional amounts of nickel and molybdenum. These savings are accomplished by increasing the manganese and silicon content of the steels which may be added as alloying elements or may be obtained from scrap residuals. It is expected that new additional series of NE steels may be added in the near future. A story on the new NE steels appears on page 74.

•

SHIPMENTS of finished steel to date this year show curtailed sheet output, a sharp gain in plate production and a big increase in alloy steel. At the same time, tin plate production has been surprisingly large, reflecting the drive to can all available produce. In June, 5,690,703 tons of steel were shipped, including 914,310 for uses not directly traced to war. Unfilled orders for July totaled 11,074,725 tons.

A year from now the steel industry is expected to have monthly finished steel capacity of 5,730,000 net tons.

Over the balance of this year, electric furnaces with annual capacity of over 700,000 tons of alloy steel are scheduled to come into production. They are needed very much as alloy steel demands far exceed present output. New blast furnaces with annual capacity of 2,500,000 tons of pig iron are scheduled to come into operation before Jan. 1. Around 1,500,000 tons will be added to the nation's open hearth capacity before the end of this year.

Steel ingot production this week, according to THE IRON AGE estimate, is at 96.6 per cent, unchanged from last week's level, a revised figure based on increased capacity.

The scrap supply situation, however, is really the key to whether steel output holds up. The flow of scrap cannot be planned like mined raw materials. Mills are charging more scrap per heat because of the lower quality and are using more limestone and fluorspar than ever before to take care of impurities. Spar charges are up nearly 25 per cent in some heats.

Probably scrap piles at plants over the nation are

50 per cent lower than they were a year ago. One company which had a reserve pile of 100,000 tons a year ago is down to 10,000 tons today. Because of lend-lease shipments, less steel scrap is being returned than in normal times. In most districts the national scrap drive is getting results, but in some areas previous drives have cleaned out the scrap.

•

THE forgotten man of the war, the lowly but useful "Junkie," whose task of collecting neighborhood scrap has been increasingly difficult during recent months for a variety of reasons, probably will be assisted somehow by the government in recognition of his vital role. His costs and other problems are being studied now by government experts, who are beginning to realize that the army of peddlers is much smaller today than it used to be. These horse and wagon collectors were the foundation of the scrap industry but in many cases price ceilings, public drives, restrictive local ordnances and the prospect of higher pay in war plants led to the loss of their valuable services. The lack of a uniform price to be paid the householder and the farmer by the Junkie has been a stumbling block.

The $20,000,000,000 war plant expansion program which WPB announced would be cut substantially to save materials for the war effort, will only be cut about 8 per cent, instead of the 25 per cent originally projected, THE IRON AGE has learned.

The facilities staff of WPB, which helps find plant capacity and assists the war effort in other ways, has succeeded in diverting magnesium castings orders to gray iron foundries instead of to a proposed new magnesium foundry. In some cases much renovating was required at the foundries and the sand had to be cleaned or replaced. Much educational work will be required.

•

GRAY iron foundries are being worked more and more into the armament picture. They have a large amount of manpower. In Europe it has become a fairly common practice to cast small shells out of steel compositions and this practice is being initiated in the United States. An article on the subject appears in this issue.

One American's Determination

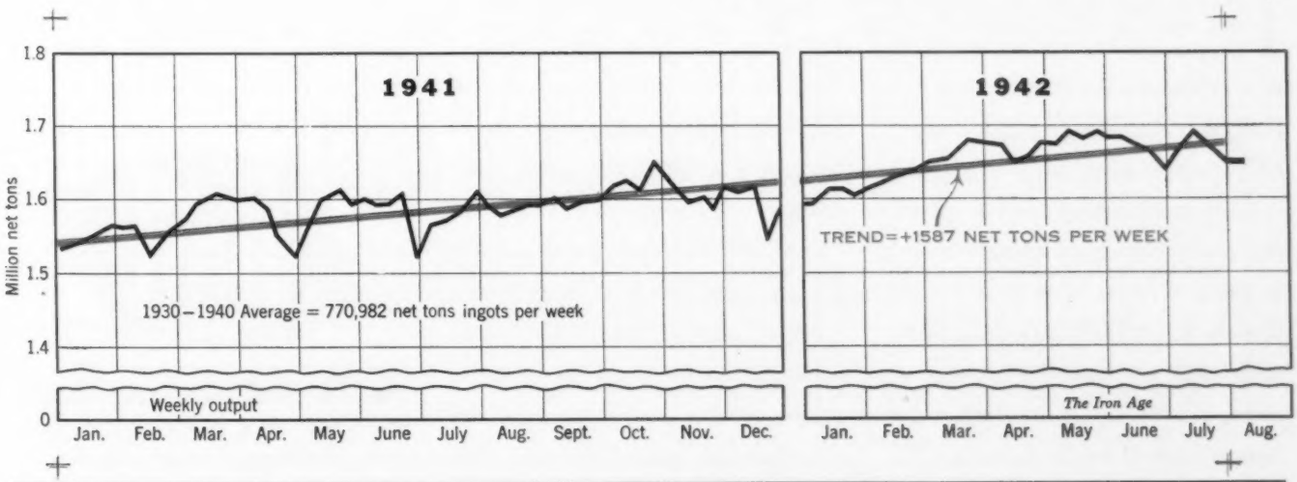
• • • "Before long we'll find these 70-ton cargo planes are peanuts, but all I want the government to do now is tell me what I can have for these 70-ton jobs. Then I'll know what I have to do to get the rest. If I can't have airplane engines I'll build an engine plant. . . . I'll have the plane in mass production in 10 months."—Henry J. Kaiser, in New York last week end.

Luxuries that the Army indulges in were struck a blow last week when steel plate which the Army thought necessary for water tanks and boilers for various camps was not placed on the August plate schedules. The Army was figuring on tanks and boilers with a life of 15 to 20 years. Steel sheets were substituted, which will last for probably three years or more.

The American mission of steel experts to England is a significant step, which undoubtedly will result in better understanding between the two Allies and perhaps eventually a lessening of the load upon U. S. mills.

The War Labor Board, which proposes to apply its steel wage formula universally, has been riding high in recent weeks and may have more to say about wages eventually than OPA. Wildcat strikes here and there over the Nation continued last week, and one outbreak brought the loss of over 2000 tons of steel.

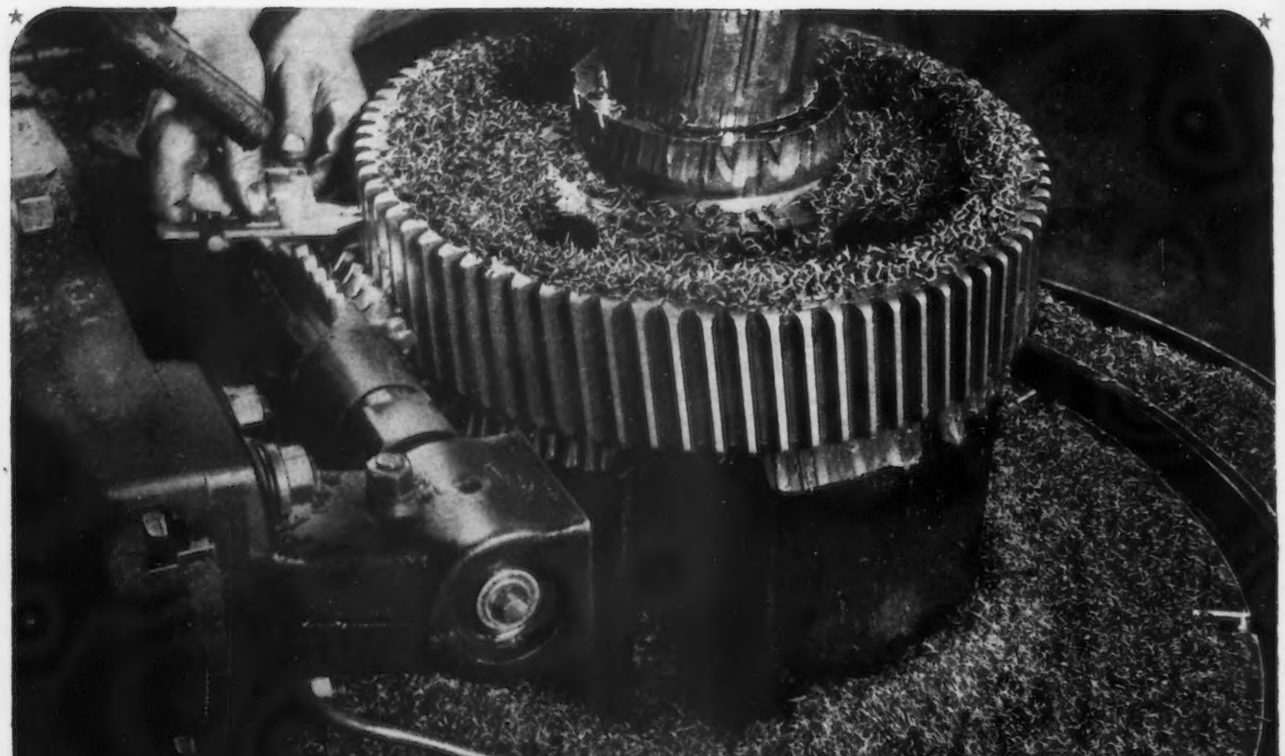
The reinforcing bar situation has taken a serious turn in that the quota system is reported to be allowing for the production of only some 85,000 to 90,000 tons monthly, as compared with the 175,000 tons per month which had been shipped by the industry in recent months. The curtailed rate of production means an output of 425,000 tons of concrete bars for the remaining five months of 1942. Meanwhile, approximately 100,000 tons will be needed for some 70 concrete barges to be constructed for use in transporting oil, while perhaps some 60,000 tons will be shipped to Latin America. The balance of 265,000 tons will tentatively have to suffice for lend-lease requirements, and to meet the needs of the Army and Navy in building up inventories at strategic points. However, this would leave very little if anything for vital construction projects.



Steel Ingot Production by Districts, Per Cent of Capacity

	Pitts-burgh	Chi-cago	Youngs-town	Phila-delphia	Cleve-land	Buf-falo	Wheel-ing	South	De-troit	S.Ohio River	West	St. Louis	East	Aggre-gate
Week of August 8..	96.0	100.0	98.0*	91.0	100.5	104.5	86.0	97.0*	101.4	101.0	102.0	111.0	90.0	96.8*
Week of August 13.	96.0	101.0	98.0	87.0	102.0	104.5	86.0	94.8	101.3	105.0	102.0	111.0	90.0	96.6

* Revised



KEEP 'EM CUTTING . . AND SAVE THE PIECES

IN this war, machine tools on the average are cutting away steel at a rate more than 12 times faster than in 1918. That's production—keep them cutting!

Keep them cutting *faster* by selecting tool steels more closely suited to the job. Case after case in our files show increases in feeds, speeds, or pieces per grind—increases, often, of 50% and more—when the *right* tool steel went to work.

Keep them cutting *constantly* by knowing the best alternate tool steel for each job. Know it, and know its performance, as insurance against a time when your first-choice steel may be short in supply.

And save the pieces! Every particle of steel, especially High Speed Steel, is important, and much critical alloy material can be saved for re-use if proper methods of reclamation and classification are employed. Let our Service Staff help with your problems of tool steel selection, treatment, use and salvage.

AL

STEEL FOR THE NATION'S WELFARE

Allegheny Ludlum
STEEL CORPORATION
GENERAL OFFICES: PITTSBURGH, PENNSYLVANIA

	Page
New NE Steel Setup	74
Experiment to Replace PRP	98
Ingots Lost by Strike	100
Steel Recovery Corp. Set	104
Machinery Inventory	104B
Steel Output Figures	104C, 145
Expansion Cut Reduced	108
Priority Changes	104A, 129

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News of Industry

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Overhauling of Priority System, Revision of Iron and Steel Branch, Other Changes Urged at Hearing

• • • **On the basis of** hearings last Thursday and Friday, Senator Harry S. Truman, Democrat of Missouri, chairman of the defense investigating committee, called for a housecleaning in the Steel and Iron Branch of the War Production Board in order to speed up the war program. He joined with Senator Harley M. Kilgore, Democrat of West Virginia, in urging immediate establishment of a strict quota or allocation system on steel orders.

Truman and Kilgore attributed part of the current steel problem to failure on the part of the government to utilize the steel making and finishing capacities of small mills. In addition, Truman said that a considerable part of the blame for not getting an early start to obtain sufficient steel plant expansion went back to failure of the War and Navy Departments to work out during peacetime any "worthwhile estimates" of what they would need in wartime.

Kilgore urged junking the steel priority system in favor of a quota arrangement that would make possible handling the nation's steel industry as an integrated unit and allocating orders directly to the plants that could fill them most efficiently. Under his plan manufacturers needing steel would take their requisitions to WPB, and receive, instead of priority slips, specific orders to specific mills for the material. He suggested use of a card index covering every mill so that the orders could be placed with the plants that could best do the job and so that all plants would have a job to do.

Difficulties surrounding the smaller steel companies and those which have proposed to go into steel making from scratch were described by several witnesses.

John F. Budke, vice-president of Parkersburg, W. Va. Iron and Steel Co., said that his plant, one of the smallest and oldest sheet mills in the United States, is able to turn out 2500 tons of steel products which could be used for war purposes each month, but that during the first six months of this year the plant had received government orders totaling only 280

Modification of Contingent Fee Bill Is Predicted

Washington

• • • In answer to letters protesting the passage of the Vinson Bill prohibiting the payment of contingent fees on government contracts, Senator Walsh, Democrat of Massachusetts, last week sent out a letter scoring the bill which, as reported in last week's issue, is taken to forbid legitimate commissions on government contracts. The letter follows:

"I have received a large amount of mail on this subject, and the Committee on Naval Affairs is now inquiring of the various Bureaus and Departments of the government what is their attitude with respect to this legislation.

"While I do not wish to commit myself in advance of the hearings that may be held on this bill, I do not hesitate to say that the opposition to the bill, as drawn, is powerful, and the bill will have to be greatly modified before favorable action is possible.

"Apparently this bill was designed to prevent fly-by-night commission people making excess profits in their contracts with the government through the period of war. Be assured that, insofar as I can gage the sentiment of Congress, there is no intention to disturb the legitimate, and long continued, relationship concerning sales made to the government in the course of business on a commission basis. . . . I am sympathetic with the many protests. . . . You may rely upon no hasty action being taken."

tons. Employment in the mill has dropped from 455 men to 145 men, many of whom went into other industries. Normal products of the firm included sheet steel, galvanized sheets, roofing, and siding, stovepipe and sheet steel pans. Wartime uses of the company's potential products, Budke said, include roofing and siding for military bases, airplane hangars, shellcases, bomb shelters and sentry shelters and many others. Recently modernized, the mill will become a small, compact, efficient unit, Budke said, and he offered to meet the sheet steel prices of the continuous strip mills on government business and still make a profit. Budke asked that representatives of the small non-integrated mills be given representation on the WPB.

War's impact on another plant brought to the committee a delegation of citizens from Canonsburg, Pa., requesting help to prevent Carnegie-Illinois Steel Corp. from closing its tin plate plant at Canonsburg. Adolph L. Zeman, spokesman for the group, said that the shutdown, ordered for last Friday would eventually force the 1900 to 2000 employees out of work and seriously affect the whole community.

J. Lester Perry, president of Carnegie-Illinois, accompanied by James E. Lose, vice-president in charge of operations; Malcolm W. Reed, chief engineer, and George E. Totten, tin plate sales manager, told the committee that the plant was bought to increase production which was needed at the time and to get a certain portion of the business, but that at present Carnegie-Illinois has no orders upon which facilities at the Canonsburg works could be applied. The works is continuing to give some employment past the closing date by continuing the tinning operations, Perry said. Lose explained that the company is unable to apply Bessemer plate to their present tin plate orders, while a large part of output from the Bessemer furnaces, totaling about 15 per cent, is used as "synthetic scrap" and sent into the open hearth furnaces to increase output there. Increased scrap collections would, of course, release more capacity, Lose said. (See also page 148.)

One witness, A. J. McFarland, president of the Wheeling Steel Corp., said that his firm had no complaint about its treatment on war orders, although production has been going down slightly. While the facilities of the plant, one of the earlier hot strip plants, are not particularly suited for the most urgently needed products, McFarland said that it is turning out "quite a tonnage" of light plates which are being used, totaling 21,000 tons in July. A part of the plant's projected expansion had been deferred, but enough was left to give a reasonable increase in pig iron, and consequently more production of open-hearth steel with corresponding reduction in scrap needs, McFarland said.

NEW STEEL AGENCY?: Reese Taylor, chief of the iron and steel branch of the WPB, told a Senate investigating committee that a new Federal agency may be established to exercise complete jurisdiction over the nation's steel supply.

Tom Smith, vice-president of the Pacific American Steel-Iron Corp., in the State of Washington, reported that his firm has applied to the Reconstruction Finance Corp. for a $50,000,000 loan to build a blast furnace with annual capacity of 350,000 tons and a steel plant with annual capacity of 550,000 to 600,000 tons of finished steel products. He said that nowhere in the United States are all essential raw materials for iron and steel production so abundant in such a limited area as on the properties of the firm.

Delays surrounding the West Coast steel making program proposed by Henry J. Kaiser, shipbuilder, were developed at length under questioning by committee counsel Hugh Fulton. Rolland C. Allen, deputy chief of the WPB Iron and Steel branch, testified at one point, that in March, 1942, WPB chief Donald M. Nelson, had gone over the head of the clearance committee in the Iron and Steel branch, to give approval to Kaiser's proposed steel plant at San Bernardino, Calif. Allen pointed out that the clearance committee had previously approved Kaiser's pig iron plant, and was still considering the steel plant, when Nelson acted. William A. Hauck, in charge of planning for the branch and chairman of the clearance committee, said that in the spring of last year, after investigating the West Coast steel situation, he had recommended a substantial increase of ingot capacity there through expanding existing plants, and development of new plants, but did not recommend the Kaiser proposal as such since the latter's application for a certificate of necessity lacked certain necessary information about raw materials. Fulton raised a question that since Kaiser was taking the risks, Hauck's function should have been to determine whether more steel capacity was necessary, not whether Kaiser had enough ore beds.

Reese Taylor, chief of the Iron and Steel Branch, testified that divided authority and lack of a flexible price arrangement to insure getting in extra scrap was partly responsible for the steel shortage. He said that serious attention should be given to putting the scrap program under one head "because it has a distinct bearing on our ability to produce steel." He testified that purchased scrap available is expected to drop from 19,000,000 tons in 1941 to 16,-

American Mission to Study British Steel Output

• • • The capacity of the United States and Britain to make weapons of war out of steel is now greater than their combined capacity to produce the steel, the new British-American Combined Production and Resources Board has announced. As a first step in attacking this problem, an American steel mission, composed of steel men and government officials, is being sent to Great Britain to plan, with the British, steel production for war use on a united basis.

The mission will study British methods and needs and investigate means of increasing output and obtaining efficient allocation of the two countries' capacity. It is possible that a British steel mission will make the similar study here when the American group has returned.

Members of the commission are: Chairman, Charles R. Hook, president of American Rolling Mill Co.; Paul F. Schucker, chief of the Lease-Lend and Import Section, Iron and Steel Branch, WPB; Lieut. Col. Paul P. Llewellyn, of Washington; Captain G. A. Duncan, for the Navy; Walter S. Tower, president of the American Iron and Steel Institute, and Earl C. Smith, chief metallurgist for the Republic Steel Corp.

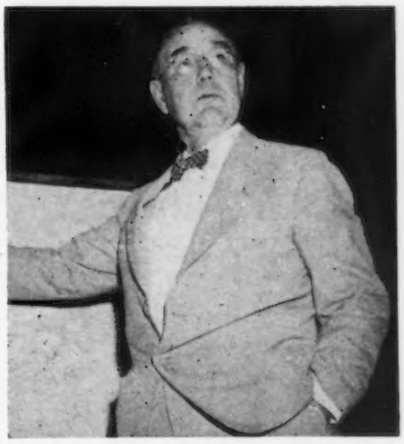
Oliver Lyttleton, Britain's Minister of Supply, is that nation's representative on the Combined Production and Resources Board, Donald M. Nelson is American member, with James S. Knowlson, vice chairman of WPB, as his deputy.

000,000 tons next year, partly because people are not junking their automobiles, and he warned that our prospective 98,000,000-ton ingot capacity next July is predicated on the purchase of 16,000,000 tons of scrap.

Fulton asked whether there were not a number of smaller facilities that might have had their capacity increased. This, said Taylor, was possible. Fulton asked why big companies had received 95 per cent of the coke capacity increase, 98 per cent of the pig iron increase, 86 per cent of open hearth facilities, and 68 per cent of electric furnace facilities. Senator Truman interposed to say that he did not want to embarrass the witness by requiring an answer, saying "it is obvious that the big steel companies wanted to maintain control and didn't want the little companies to get expansion."

Taylor told the committee that there is excess plate capacity today in relation to other products and that the worst shortage is in steel bars, used in the manufacture of nuts and bolts and in the making of tanks, ships boilers and other war products. Another part of the trouble in the steel program is lack of balance, Taylor said, adding that "we hope to improve" the determination of supply. He explained that the steel distribution committee has met with the large integrated companies, is meeting with the small integrated companies, and within three weeks will meet with the non-integrated companies on the problem of distribution. He pointed out that under an order of July 25 it was the intention of the iron and steel branch to see that the rate of operation for non-integrated mills compares favorably with integrated mills and to guard against shutdowns of the smaller plants. Fulton cited Taylor's figures showing that 5,690,703 tons of steel were shipped during June including 914,310 tons described as being for "all other" uses after supplying the Army, Navy, Maritime Commission, defense projects, Lend-Lease. warehousers, export other than Lend-Lease and railroads. Against the June shipments, unfilled orders requested for shipment during July totaled 11,074,725 tons. Fulton suggested these figures indicated a breakdown in the system of placing orders, and Taylor agreed "it's an important contributing factor to the shortages."

Truman jumped on the "all other" figure and said "you're going to have to know where all the steel is going to continue the war program on an efficient basis." Taylor replied "that's what we're trying to do." He added that the problem of how much steel can be taken from direct war production to provide added facilities for steel, comes under the heading of "strategic determination." Taylor admitted he believed some change in the priority system might be needed, and said his suggestion would be some kind of quota system along with priorities. Frederick M. Eaton, assistant WPB general counsel said there is no general satisfaction in the WPB with the priorities system, and that J. A. Krug, new deputy in charge of priorities, is trying to improve it.



WPB STEEL MAN: Rolland Allen, deputy chief of WPB's iron and steel branch, talks to the Senate committee.

Officers of three small steel finishing mills appeared Tuesday.

John P. Hosack, vice-president and treasurer, Mahoning Valley Steel Co., Niles, Ohio, and A. M. Oppenheimer, president and general manager, Apollo Steel Co., Apollo, Pa., both said their plants are running less than 80 per cent of capacity and that large firms which formerly solicited their business now are clamping down on supplying the steel bars which both plants used in turning out sheet steel. J. A. Downey, president, Eastern Rolling Mill Co., Baltimore, Md., testified that by starting several years ago his plant had successfully converted from producing sheet steel to making alloy steel, but still is running only 67 per cent of capacity. Henry J. Landahl, Tacoma engineer, charged that for 30 years his efforts to start a steel industry in the Pacific Northwest had been blocked by large interests.

The committee plans to continue its steel inquiry next week.

G. A. WELDING Shop Notes

NO "BLUEPRINT BLUES"

Before any order goes into the shops of the General American Plate and Welding Division, it must first visit the Engineering Department. Here a technically trained staff details each operation, either from customer's rough sketches or finished drawings. All shop procedure is scheduled for rapid and accurate execution. There are no "blueprint blues" at Sharon —because each line of each diagram is drawn and checked by men who know steel and know fabrication through years of experience.

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New System to Replace PRP Will Be Given Trial Soon

Washington

• • • **WPB soon will conduct** an experiment in production and material control in selected civilian and military industries through the medium of a new device known as the Contract Production Control. If the experiment succeeds, WPB may discard the Production Requirements Plan, and with it, priority ratings.

The essence of the plan is to control production through obtaining production schedules and raw material bills for every part which goes into the manufacture of an item contracted for, from the prime contractor and all of his subcontractors, and suppliers.

The plan may be called a vertical allocation, or rationing or warrant system, and it provides for control over the rate of production, and material control from the standpoint of product.

Instead of a manufacturer making application for materials which no one knows whether he needs or not, WPB and the armed services will be able to compare product raw material bills against individual contract requirements. Army and Navy already have secured, in some instances, material bills and have put them to good use in fulfilling their requirements.

The armed services will submit their requirements so obtained to WPB, and WPB will review them. The method by which the rate of production will be controlled is that contracts for a particular item, which strategic demand no longer requires, may be deferred for a long period of time, whereas other contracts for products more critically needed may be speeded up. Raw materials can quickly be kept in balance in this way.

Another advantage claimed for the Contract Production Control System is that it will do away with false demands created by the handing out of priorities for which there is no material. During the experiment sub-contractors and suppliers will pass their production schedules and bills of material back to the prime contractor who will tabulate and transmit them to the WPB.

U. S. TANKS IN RUSSIA: M-3 medium tanks arrive at Murmansk on the deck of an American freighter. The slanting object in the background is a life raft, set for quick release over the side.

Skill Enables Slashing Gun Production Costs

• • • How Canada has lowered its costs on gun production is shown in a recent Dominion government report. Highlights include:

Bofors 40-mm. anti-aircraft gun—Man hours required to produce one barrel cut from 186 in October, 1940, to 44.8 hours in June, 1942.

Anti-tank guns — The first two-pounder required 1,219 man hours, contrasted with current production requiring 350 hours. The man hours on the six-pounder have been cut from 930 to 375.

No. 4 rifle (modern equivalent of the Lee-Enfield) — The cost in September, 1941, for rifle, bayonet and scabbard was $97.43; reduced to $47.43 in April, 1942.

Browning machine gun—This air cooled, pneumatically fired gun for planes cost $402.99 in November, 1941, compared with $220.50 in April, 1942.

Bren light machine gun—This air cooled, gas operated light gun cost $390.59 in early 1941, against $192.28 in April, 1942.

Nelson Criticized for Army-Navy Production Power

• • • **The House Defense** Migration Committee, in a report presented Monday, by John H. Tolan, chairman, severely criticized Donald M. Nelson, head of the WPB, for alleged transfer to the armed services of authority over procurement and production, contrary to President Roosevelt's Executive order of Jan. 16.

The WPB, according to the Tolan report, must drastically revise its thinking in keeping with urgent military requirements, for if the war services are to handle procurement and production there will be no place for the War Manpower Commission.

The differences in thinking between the WPB and the armed services on the expansibility of raw material production, according to the report, are that "our war program is in perilous condition if there are to be material shortages when we are producing at one-third or less of our peak production rate." The committee expressed the belief that fewer material shortages will exist if they are successful in their reorganization.

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A FEW WIRES TYPICAL OF ROEBLING'S BROAD SPECIALTY PRODUCTION
WIRES THAT ARE WINNING PRODUCTION LINE BATTLES!
ROUND WIRE TO SPECIFICATION
FLAT WIRE
SHAPED WIRES FOR FLEXIBLE SHAFT CASING

SHAPED WIRES FOR FLEXIBLE SHAFT CASING call for dimensional accuracy and temper held within extremely close limits . . . exacting steel analysis and high fatigue strength. They are a typical war-essential use for the high quality rounds, flats and shapes that Roebling makes.

Do they suggest a short cut to your Victory assignments? You can save precious machine-time and man-hours by having Roebling give you wire in the *right* steel analysis, finish and dimensions.

We have the kind of steel-making facilities and custom-trained organization for just this kind of work . . . have furnished the answer to hundreds of such production line problems, where wire plays its part. Prompt action on war orders.

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TRENTON, NEW JERSEY — Branches and Warehouses in Principal Cities

Ingots Lost in Strike; Inland Signs With CIO

INLAND STEEL SIGNS: Officials of Inland Steel and of the United Steelworkers of America meet at Indiana Harbor just two weeks after the conclusion of their case before the WLB. Signing a contract covering working conditions at the Harbor and at Inland's Chicago Heights plant are, left to right, John Doherty, of the union; J. H. Walsh, Inland vice-president in charge at Indiana Harbor; Fred M. Gillies, superintendent, who conducted all negotiations; Philip H. Murray, president of the union and of the CIO; and Joe Germano, regional director of the union; standing, John Sargent, president of Local 1010.

• • • **More than 2000** tons of urgently needed steel were lost irrevocably at Pittsburgh late last week when more than 100 workers at Carnegie-Illinois Steel Corp.'s Homestead works walked out over a tonnage rate dispute which made 900 other men idle. The men returned to work Sunday night on pleas of Federal and union officials. Prompt action on the grievances was promised. The Steelworkers' union claimed the strike was an "outlaw" walkout and was precipitated by non-union members but other workers joined later and 24 open hearth furnaces were forced down.

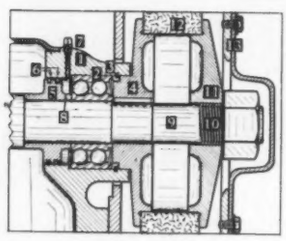
At Pt. Pleasant, W. Va., last week union officials ended an outlaw strike of 1000 construction workers on a new ordnance plant there.

Another sporadic flareup at the Pottstown, Pa., plant of the Bethlehem Steel Co. last week ended but not before the works was virtually shut down. About 400 CIO pickets forced the closing down of the plant which is on war work. Disputes between CIO and AF of L were involved in the fracas. The company claimed the CIO steelworkers' union was attempting to enlist men in the union.

At Trenton, N. J., full production was started last week at the cable and wire works of the John A. Roebling's Sons Co. after 29 employees in "bottleneck" departments resumed work. A wage dispute involving these men caused 1600 other employees to stop war work production because of lack of raw materials.

Slightly more than two weeks after the War Labor Board handed down its decision on the "Little Steel" case Inland Steel Co. concluded contract negotiations last week with the Steel Workers of America and signed a contract embodying the directors of WLB.

Other companies which are to sign exclusive contracts with the USWA are Bethlehem Steel Co., Youngstown Sheet & Tube Co. and Republic Steel Corp. The WLB gave the union a 44 cent an hour raise, maintenance of mem-



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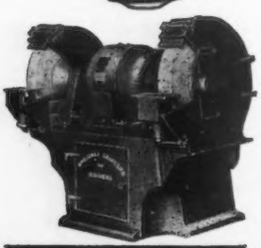

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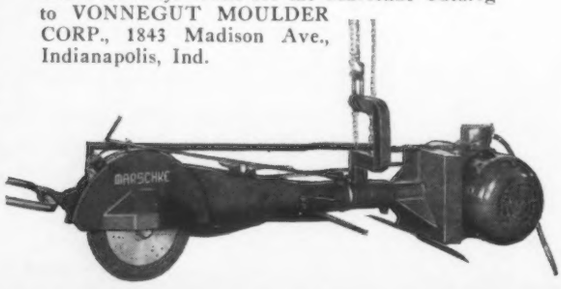

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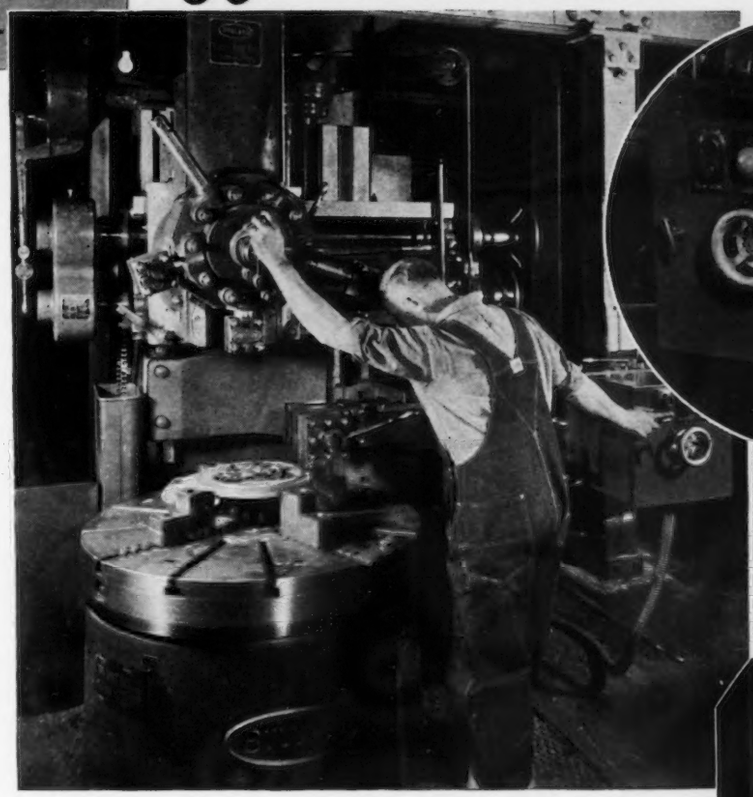

(Above) EC&M ball-bearing-equipped rheostat with fast-slow, stop, start-jog push buttons on cabinet-door. Rheostat is geared to side head tool holder for automatic operation. It can be disconnected for manual adjustment when desired.

WITH this unique turret lathe control the "metal-removed-speed" remains constant. This assures fast operation and use of the cutting tool at its rated capacity. It is accomplished by automatically increasing the speed or r.p.m. of the table as the diameter of the cut decreases. It results in increases as high as 50% in productive capacity.

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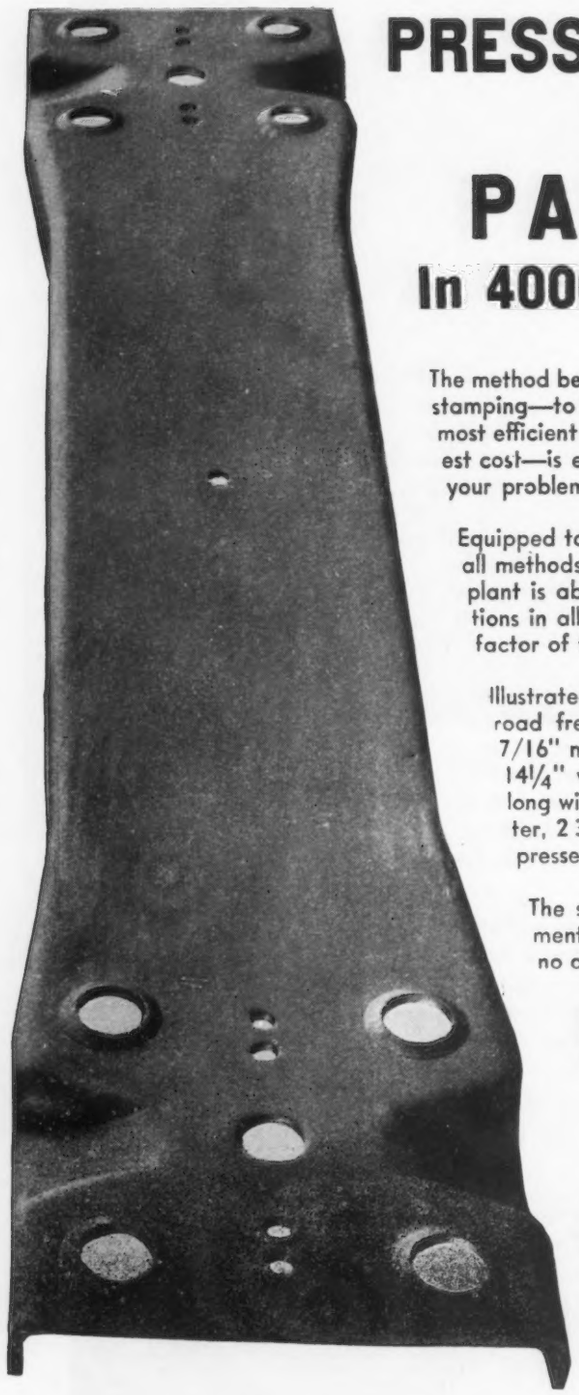
bership rights and the checkoff of union dues.

The perplexity felt by labor observers over the labor peace question was intensified by the assertion, last week, of Murray that the next move was up to Green of the AFL, and the retort by Green that it was now Murray's turn to act. The atmosphere surrounding the two labor leaders was definitely not one of peace.

Aside from whatever disagreements may exist between the CIO and the AFL, there also remains the problem of John L. Lewis and his mine union. While not as powerful as he was a year ago, Lewis is still considered a factor to reckon with in the labor field and a factor that must be taken into consideration if a true labor peace is to be established.

That the three, Lewis, Green and Murray, can be brought into agreement in the near future seems most unlikely to observers here, unless the administration exercises its influence to force the three together.

The committee appointed by the CIO and the AFL to discussing the possibilities of uniting the two groups are expected to start negogiations in Washington the week of Aug. 16.



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Plastics Ease Out Rubber, Light Metals, in Airacobras

Buffalo

• • • **Substitutes to save** critical materials in the manufacture of Airacobras by the Bell Aircraft Corp. have been found to be "completely satisfactory" and the company's research engineers now are investigating the practicability of some new types of plastics.

Flexible plastic tubing has been substituted for rubber tubing; aluminum alloy ammunition boxes have been replaced by boxes fabricated from a linen-base plastic fiber material, and name and instruction plates, formerly made from light alloy metals, now are made of phenolic fiber plastics.

Automobile Mechanics Sought For Overseas Military Duty

Detroit

• • • **A drive to** recruit 22,000 experienced automobile mechanics for overseas military duty before the end of 1942 has been launched under the sponsorship of the National Automobile Dealers Association. Already two regiments of 8000 men have been recruited and installed in a southern camp, and it is expected that before next year a force of at least 30,000 mechanical experts will be in condition for actual service.

Automobile dealers, mechanics, salesmen, and others familiar with automobile maintenance are being recruited for the work, which is being handled by Major Herman Goodin through the Ordnance Department.

Woodward Files Tax Suits

Birmingham

• • • **Seeking to recover** about $30,000, claimed to represent over assessments of income and excess profits taxes for the years 1936 and 1937, three suits have been filed in Federal Court here by Woodward Iron Co.

550-MILE PIPELINE: Making the first weld on the 24-in. pipe line destined to carry black gold from Texas to Illinois. The $35 million project will be completed and in service by Christmas, Secretary Ickes announced. This photograph shows the Williams Brothers Corp., first of the seven contractors to start work, making the first weld on the line with Lincoln arc welding equipment.

Wright Workers Return As Aluminum Shortage Eases

• • • **Most of the** 3500 men recently laid off at one of the New Jersey plants of Wright Aeronautical Corp. were back on the job last week. A raw material shortage forced the company to lay off 3000 men in one section of the plant on July 29. As they returned on Aug. 3 the foundry was in turn shut down and 500 men had to be laid off, but most of them were back at work three days later. While the company gave no details it is believed a shortage of aluminum ingots was responsible for both layoffs.

Workers Ride to Work Again

Birmingham

• • • **A bus and taxi strike** that had crippled public transportation in the three North Alabama industrial cities of Anniston, Huntsville and Gadsden with resultant hampering of the war effort, was settled last week after the strike had been in progress for a week.

Protection of Steel Sought In Two New Developments

• • • **Two new developments,** from the field of chemical processing, were announced recently as being effective in the protection of highly finished steel parts from rust and corrosion. First of these was a new phenol coating, recently developed by the Atlas Powder Co. as a substitute for brass plating on steel shell cases.

The second is a newly announced product of the Dearborn Chemical Co., which is a moisture, oil and acid resisting wrapping material formed of DuPont cellophane laminated to a light, cotton fabric known as scrim. It is described as a light weight, moisture-proof, wrapper which can either be sealed by twisting the ends of the package by hand, or heat sealing.

This is no place for a LOOSE NUT

. . . and that goes too for thousands of other vital positions on America's fighting airplanes where careful designers have placed Elastic Stop Nuts. These self-locking self-gripping fastenings have proved, through fifteen years of reliable service on aircraft, that they remain tight under all combinations of vibration, stress, shock, exposure to weather, and prolonged heavy duty. They are used today on *every* military and transport airplane built in the Western Hemisphere.

There are more Elastic Stop Nuts on America's airplanes, tanks, Naval vessels, and other war equipment, than all other lock nuts combined.

•

ELASTIC STOP NUTS may be the solution to *your* fastening problems. Sample nuts, for testing, will be furnished without cost or obligation.

•

» Write for folder explaining the Elastic Stop self-locking principle

ELASTIC STOP NUT CORPORATION • 2368 VAUXHALL ROAD • UNION, NEW JERSEY

WITH THE RED LOCKING COLLAR . . . . SYMBOL OF SECURITY

Steel Recovery Corp. Organized To Purchase and Sell Idle Stock

Washington

• • • **Organization** of the Steel Recovery Corp. with headquarters in Pittsburgh, was announced Aug. 8 by WPB. The corporation, acting as agent of the Metals Reserve Co., will make arrangements for the purchase and sale to war contractors of idle, frozen and excess stocks of iron and steel, as part of WPB's nation-wide program to direct all scarce materials into strategic production as rapidly as possible. It will function in much the same manner as the Copper Recovery Corp., which is now in the process of channeling millions of pounds of copper into war use.

At the first meeting of the board of directors, held in Washington, George L. Stewart, vice-president, Edgar T. Ward's Sons Co., steel distributers of Pittsburgh, was elected president of the Steel Recovery Corp. Other members of the board are: C. W. Nichols, vice-president, Metals Reserve Co.; John May, vice-president, American Steel & Wire Co., Cleveland; N. J. Clarke, vice-president, Republic Steel Corp., Cleveland; B. E. Kibbee, vice-president, Sharon Steel Corp., Sharon, Pa.; Richmond Lewis, president, Charles C. Lewis Co., Springfield, Mass.; Everett D. Graff, president, Joseph T. Ryerson & Son, Inc., Chicago; Lester Brion, president, Peter A. Frasse & Co., Inc., New York; Walter S. Tower, president, American Iron and Steel Institute, New York, and Walter S. Doxsey, president, American Steel Warehouse Association, Cleveland.

The Steel Recovery Corp. and WPB's Inventory and Requisitioning Branch and Iron and Steel Branch will work together in the coming program. The Inventory and Requisitioning Branch will be responsible for locating idle iron and steel, for establishing prices at which it will be purchased by the government, and for requisitioning when other attempts to secure materials are unsuccessful. The Iron and Steel Branch will direct allocation of the material to war plants, and the Steel Recovery Corp. will arrange for inspection, supply shipping directions, and handle payments for government-purchased stocks. It will also bill purchasers of this material on behalf of the Metals Reserve Co.

The extensive program now being initiated has been in the process of development for a number of weeks. Exact figures are not immediately available, but coming surveys are expected to reveal the location of millions of tons of iron and steel rendered idle by industry's conversion from a peacetime basis to war production.

By the end of this month the first of 250,000 inventory report forms will be mailed to known holders of iron and steel. These will go to 37,000 owners of stainless steel. Similar programs covering other types will follow. Accompanying the forms will be a letter explaining the program and a list of prices at which the government will purchase material which cannot be used in its existing form and must be remelted before taking its place in the war effort.

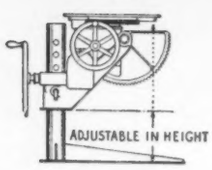
In cases of material usable "as is" by qualified war contractors, owners and potential buyers will be notified so that private sales may be arranged.

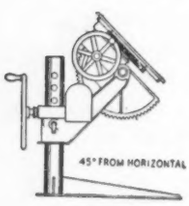
Every attempt will be made to find uses for idle material in its existing form, but where this cannot be accomplished it will be purchased by the Steel Recovery Corp. for use as scrap.

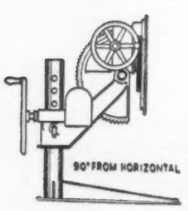
Oilgear Contract Cancelled

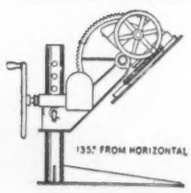
Milwaukee

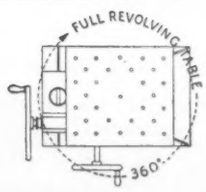
• • • **Because large** and critical machine tools needed to equip the plant are not now readily available, the government is reported to have cancelled the contract for construction of a $1,374,000 plant being erected by the Oilgear Co.











AFTER a welding assembly is once fastened to the table of a C-F Welding Positioner, the welder, without any other help, can tilt the work to any angle from horizontal to 135° beyond horizontal and he can turn it to any degree within a complete circle. This means better welds all "down hand," safer handling and faster production. Sizes from 1,200 to 14,000 lbs. capacity are described in our booklet WP 22. Write for your copy. It tells the complete story.

CULLEN-FRIESTEDT COMPANY
1303 S. Kilbourn Ave. Chicago, Illinois

PD-25-A Reports Will Be Grouped for Last Quarter

Washington

• • • **WPB plans** for the fourth quarter to take the information submitted on PD-25-A with respect to requirements and compare them with known supply to give out no more material than there is available. This means that PD-25-A requirements, for instance, in iron and steel will be grouped and tabulated and if demand exceeds supply, deductions will be made "by rule of thumb" taking into consideration inventory, unfilled orders and previous shipments.

In order to effect this change, WPB is training present personnel to handle the new procedure. It is claimed that the blind paring of requirements by WPB analysists will cease but that reductions in the amounts of material granted will be made with supply in view.

Meanwhile, on Tuesday WPB outlined new procedures for applying the high preference ratings assigned under the terms of Priorities Regulation No. 12, contained in a complete revision of the regulation. At the same time, Priorities Regulation No. 1 was amended to change the order of ratings in the "AA" series. Hereafter, All AA-1 and AA-2 ratings are to be treated as the same; neither will take precedence over the other. A new rating of AA-X is created which will be lower than AA-1 or AA-2 but higher than AA-3. The purpose of this change is to raise all outstanding AA-2 ratings to the AA-1 level without re-rating them individually, and to provide a new rating which will correspond hereafter to the AA-2 level.

The most important changes contained in Regulation No. 13 are as follows:

Permission is granted to assign reratings to purchase orders to get operating supplies up to 10 per cent of the value of materials processed to fill a rerated order, to all companies whose orders are rerated. PRP users were formerly forbidden to extend reratings to obtain operating supplies.

The super ratings may now be applied to outstanding purchase orders for material to fill the rerated order by telegram, letter or by issuance of new purchase orders with the higher ratings, as well as by use of PD-4Y.

Rerating directions in the PD-4-S series may be used by military officials not only to rerate orders which have been placed with prime contractors but also on subcontractors' orders.

The provision regarding the effect of a rerating on a production schedule has been modified to eliminate the distinction between a "fixed production schedule" and a "production schedule." The regulation now provides that no company is required to interrupt its schedule for 40 days if such an interruption caused by rerating would mean substantial production loss.

An entirely new procedure is provided for application of rerating by PRP users. The chief feature of this procedure is that a PRP user may not oftener than twice a month revise the rating pattern of its outstanding purchase orders in accordance with rerating it has received.

This means that if a PRP user which is filling a certain volume of A-1-A has 50 per cent of these orders raised to AA-2 raised to AA-1 it may without further authorization raise to AA-1 the ratings on 50 per cent of the purchase orders it has placed for materialism.

In revising its whole rating pattern on outstanding purchase orders as provided by the amended regulation, a PRP unit will adjust the percentage of AA-1 and A-1-A's to conform to the percentage pattern of ratings (on the basis of dollar volume) of the orders which it has scheduled for production.

To take a simplified example, suppose that a PRP user had 33 1/3 per cent of his production by dollar value $1000 A-1-A. If half of the A-1-A orders are rerated AA-1, the rating pattern will change to 16 2/3 per cent AA-1 for $500 worth and 16 2/3 per cent A-1-A for the remainder. The company may recalculate its rating pattern in this way twice a month, using percentages of dollar volume and apply corresponding reratings to its outstanding purchase orders for the needed materials. However, no single purchase order may be rerated more than once in any 31-day period. In making this calculation, another provision of the amended regulation permits the PRP users to group all ratings from A-1-B through A-1-K and apply it to the whole group, the highest rating within the group previously authorized on its PRP certificate. It may do the same with all orders rerated A-2 to—A-10 inclusive. PRP units which rerate their outstanding purchase orders are forbidden to change the rating pattern so that the percentage of high ratings would exceed corresponding ratings on the orders they have scheduled for production.

Inland Starts Scrap Drive among Customers

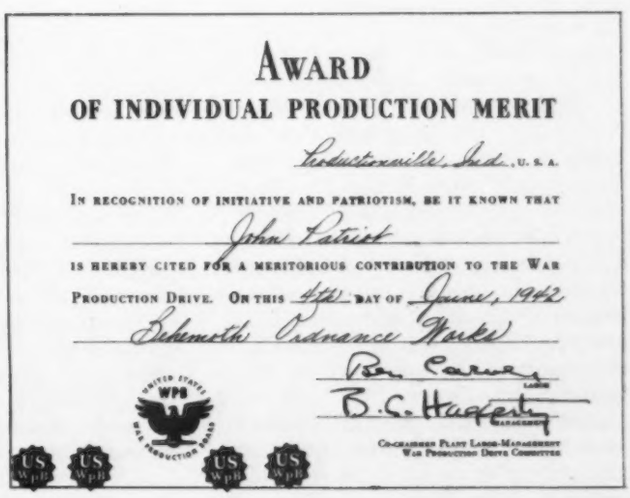
Chicago

• • • **In addition to** cooperating in the steel industry's nation-wide scrap drive, Inland Steel Co. here is also conducting an intensive drive among its customers, urging them to scrap every pound of unused material.

Inland has assigned a man to follow up reports of locations of scrap tonnages to see that the material is moved into consumption.

The results of the mail effort by Inland's is reported to be very encouraging, with many out of the way customers, who would not be reached by ordinary methods, reporting some fair-sized lots of scrap.

AWARDS TO WORKERS: A plan of individual awards to workmen in war plants who devise means for more or better production was announced by WPB. This "Award of Individual Production Merit" is granted by plant committees, the "Certificate of Individual Production Merit" will be awarded by War Production Drive Headquarters, and the "Citation of Individual Production Merit" will be granted by a technical committee of WPB.



AWARD
OF INDIVIDUAL PRODUCTION MERIT

Productionville, Ind., U. S. A.

In recognition of initiative and patriotism, be it known that

John Patriot

is hereby cited for a meritorious contribution to the War Production Drive. On this 4th day of June, 1942

Behemoth Ordnance Works

Ben Carney
Labor

B. C. Hagerty
Management

Co-chairmen Plant Labor-Management War Production Drive Committee

Inventory of Second-Hand Machines Inaugurated by OPA

Washington

• • • **An inventory of** every piece of second-hand machinery in the United States held for sale has been begun by OPA, it was announced on Monday. The primary purpose of the inventory is to provide OPA with basic information required in connection with administration of Maximum Price Regulation No. 136, as amended, which establishes maximum prices for most machines and parts and machinery services, including second-hand machinery.

In addition, the inventory has these purposes:

1. It will provide OPA and WPB with a complete and accurate census of idle machinery which owners and brokers desire to sell, together with the prices they ask for the machinery. As a list of machines awaiting sale, it will thus provide WPB with a stock tabulation of second-hand machines available to qualified purchasers.

It will locate obsolete machines containing thousands of tons of scrap iron and other waste materials which may be recovered by the Salvage Committee of the WPB Conservation Division, and after dismantling, added to the nation's vital scrap metal piles.

Price Administrator Leon Henderson revealed that there are now over 35,000 machines listed in the ever-expanding inventory classifications. The number of machines is expected to rise to over 500,000. OPA officials estimate there may be a billion dollars of idle second-hand machines catalogued before the inventory-taking is completed some six weeks or so hence.

"The time is rapidly coming when there will be no more new machinery being produced except that absolutely required in the war effort," the Price Administrator declared. "Planes, tanks, ships, guns and ammunition will need increasing tonnages of basic materials. Civilian industry is going to have to get along with what machinery it already has. We can save thousands of tons of materials and many millions of man-hours of labor by utilizing the idle machinery in the warehouses of dealers, manufacturers and private industry — inactive machinery which the owners are holding for sale."

Although just getting started on a broad scale, the second-hand machinery inventory already is bearing fruit. In one company alone has been found 50,000 tons of obsolete and worn-out machinery that may be converted into scrap. An idle heavy plate straightening machine, valuable in straightening ship plates, was found stored in Missouri. By this inventory two 3¼-ton buckets for steam shovels which had been rusting in another concern's yards were found. The scrap yield at this concern should be around 200 tons altogether.

Through the inventory, officials have found a complete distillery —built some years ago but never used. Another distillery—one of 1000 gal. capacity—was found idle and unused in California. In a four-block area in New York, were found 80,000 sewing machines stored in garment concerns' warehouses. Over 600 wood-working machines—ranging from 20 to 60 years in age—were found stored in a warehouse in New England. The owner of the machines had not made a sale in 20 years. Some of the 600 are to be listed with OPA for sale, others turned into valuable scrap.

The OPA, Mr. Henderson disclosed, has sent instructions to all machinery price specialists in all its regional, state and district offices to start distributing to all second-hand machinery dealers and industrial and business concerns copies of a new form (2:10:P1) upon which inventory reports are to be tabulated. Wages and Hours Division inspectors of the Department of Labor are to assist OPA field

Owners of second-hand machines held for sale are asked to supply the name of the machine, its manufacturer, certain descriptive data, its present condition, and the price of an equivalent new machine as of Oct. 1, 1941. They are also asked to state if the machine is rebuilt and guaranteed and to give their offering price. The reports are to be filled in by the owner of the second-hand machine and returned to OPA within 10 days following receipt of the forms.

The listing, OPA said, is to include all forms of processing machinery, electric motors, circuit breakers, transformers, etc., pumps, blowers, construction and mining equipment offered for sale, chemical machinery, railroad equipment and all similar second-hand machinery and equipment in the hands of dealers. Included with dealers are new machinery manufacturers who may rebuild or offer for sale their own or other second-hand machinery.

Field representatives are being instructed to remind dealers and business concerns that all sales of second-hand machines henceforth must be reported to OPA. The inventory form (2:10:P1) is so designed that it can be used also for reporting to OPA additions to second-hand machine stock, sales or other dispositions.

Then Came the Dawn

• • • **A Southern character** by the name of old Black Joe looked like

the man in the woodpile as the big investigation of black market purchases of steel went ahead full blast this week. The legendary Joe was last seen riding Black Beauty in a blackout with federal agents in pursuit. But it's always darkest before dawn, or at least that's the way the black market looks through smoked glasses. Now you see it, now you don't.

We can tell it in two nutshells and keep away from sponge iron. First Frank Higgins said it was "as black as the ace of spades," referring to warehouse purchases of steel in just under carload quantities. This brought big black headlines and 47 government statements. But the next day his father, A. J. Higgins, said "there was nothing illegal in their selling us steel."

Market, market, who's got the market. Blackout.

P.S.—A black market is a market that is carried on in violation of all civil regulations, and is entirely clandestine or bootleg.

Negotiation Failure Throws U. S. Steel Case into WLB Lap

Pittsburgh

• • • **Negotiations between** the United Steel Workers of America and the five manufacturing subsidiaries of the U. S. Steel Corp. broke off on Aug. 10 when the corporation could not reach an agreement upon "all of the provisions of the so-called Little Steel directives," thus throwing the case to WLB.

The company continued further, saying "in matters as fundamental as maintenance of membership, checkoff, and wages, particularly those which involve, despite a labor contract, retroactive features, it would seem not only consistent with the needs of the case, but entirely consistent with the objectives of the National War Labor Board to permit that agency to develop an equitable solution."

Some observers here believe that the U. S. Steel's major objection to the demands of the CIO, center around the unions' attempt to make the recently granted wage increase retroactive to Feb. 6, although the company was only notified of the intention to renegotiate the wage contract on July 21.

The company evidently feels that the CIO should have notified it of intentions to renegotiate its contract on Feb. 6 when it began negotiations with the Little Steel group. It appears that the CIO automatically expects to get the same treatment accorded it in the Little Steel dispute despite the legal aspects of contractual agreements. Equalization of pay, geographically, was also a stumbling block it is thought.

In the "Little Steel" rulings and also in the International Harvester case, the WLB made the suggestion that the lack of a contract with the union justified the union in making wage demands whenever they thought it proper. In the Little Steel ruling, the WLB said—"no collective bargaining agreements were in existence between these (Little Steel) companies and the union when . . . the union placed its demands for a dollar a day general increase. The union had every right to make that demand since it did not have any contract with these four companies which might have required that the earlier wage increase of April 9, 1941, be effective for a fixed period."

WITH THE RECORD SMASHERS

(All reports are for July)

The Company	The Achievements
Allegheny-Ludlum Steel Corp.	Shipments of electric furnace steels at $9,250,000, all for war program, were 33 per cent over the average for 1941 of $7,500,000 per month.
American Rolling Mill Co.	Fabricating division set all-time monthly high mark in shipments, exceeding June by 513 tons. Norton furnace at Ashland set a pig iron production record.
Carnegie-Illinois Steel Corp.	Furnaces broke nine monthly records. Company pig iron output at 1,458,728 tons was best in its history. Open hearth department at Farrell, Pa., works produced 90,684 tons of steel ingots, surpassing its March, 1942, record. A single blast furnace at the Edgar Thomson Works exceeded its January, 1942, peak by turning out 35,691 tons of iron. At Gary works two blast furnaces made new records as did two rolling mills. At South Chicago the blast furnace department and the electric steel department reached new peaks. At the Gary sheet and tin mill the 80-in. hot strip mill topped its June record of plate production by almost 20,000 tons.
Inland Steel Co.	In 24 hours one strip mill rolled enough plate for two Liberty ships. This exceeded a previous record by 25 per cent.
Republic Steel Corp.	Twenty-five departmental records smashed in the month. Pig iron output exceeded all-time record made in March. Other records set in electric furnace division, armor plate rolling department, and various other divisions.

July Plate Output at Record; Strip Mills' Share Is Higher

• • • **More than 75 per cent** of July's record steel plate shipments went to fill Army, Navy and Maritime Commission orders, Reese H. Taylor, WPB Iron and Steel Branch Chief said on Monday. The remainder was used for export and essential non-military requirements such as transportation, plant facilities and machinery.

July plate shipments were 1,124,118 tons as compared with June shipments of 1,050,962 tons. Strip mills shipped 550,537 tons in July as against 489,704 in June. Production of shapes and piling was slightly ahead of the June total. July shipments were 481,814 as compared with 481,182 tons in June.

New Methods Reduce Bomber Turret Cost 30%

Detroit

• • • **Bomber turrets** are now not only being made in large volume at the Briggs Mfg. Co.'s new plant, but their cost to the government has been reduced by the company more than 30 per cent through improved manufacturing techniques and conditions, according to W. P. Brown, president of the company.

This new plant, which was completed on May 15, is already 53 per cent ahead of the original schedule set by the Army Air Forces, and is now shipping at the rate of several million dollars worth of turrets a month. Receipt of additional machinery now on order and sufficient supplies of raw materials will increase the present production. Only 25 per cent of the machinery required has thus far been delivered.

Briggs received its first contract to make bomber turrets on Aug. 18, 1941, and began operations immediately. The first turret was delivered on Dec. 23, and hundreds more were completed and delivered before the new plant was finished. On May 15 deliveries were 30 per cent ahead of schedule. By July 1, they were 40 per cent ahead of schedule; and on Aug. 1, 53 per cent. July production alone was 100 per cent greater than set up.

Barringer Warns Against Useless Junking of Statues

Washington

• • • **Unnecessary sacrifice** of historical monuments and statues is threatened by a lack in Washington of technical knowledge of scrap and a misconception of its supply, Edwin C. Barringer, president, Institute of Scrap Iron & Steel, Inc., warned last week.

"What is needed in Washington is not incitement to destroy irreplaceable monuments and relics or tear down railings and ornamental iron work, but a completely revised approach to the scrap problem which will make available vast quantities of scrap now dormant because the scrap industry is not permitted to function properly.

"Statues are principally cast from nonferrous metals alloys, in many forms of which there is now actually a surplus," said Barringer. "Many dealers are unable to market certain grades of copper-base alloys and also some forms of aluminum scrap, even below OPA ceiling prices, one reason being that specifications for much war work permit the use of virgin metal only.

"If the war lasts long enough there may be an unsatisfied demand for scrap which statues and monuments can help fill, but to destroy them now would merely increase an already-existing surplus in some classifications of nonferrous scrap.

"Many old cannon, especially those antedating the Civil War, are also bronze and brass, the latter especially being in slack demand. Most Civil War cannon and cannon balls are cast iron, a grade of scrap in which there is no particular shortage but which could be melted down. World War tanks and guns are largely alloy steel, which can be used in making special steels."

War Dooms Old Railroad

Chicago

• • • **Sentiment was forced to** give way to the inexorable demands of the war effort recently when Hyman-Michaels Co. was awarded a contract for scrapping the Promontory Point branch of the Southern Pacific Railroad. Completion of this branch in 1860 marked the joining of the first transcontinental railroad.

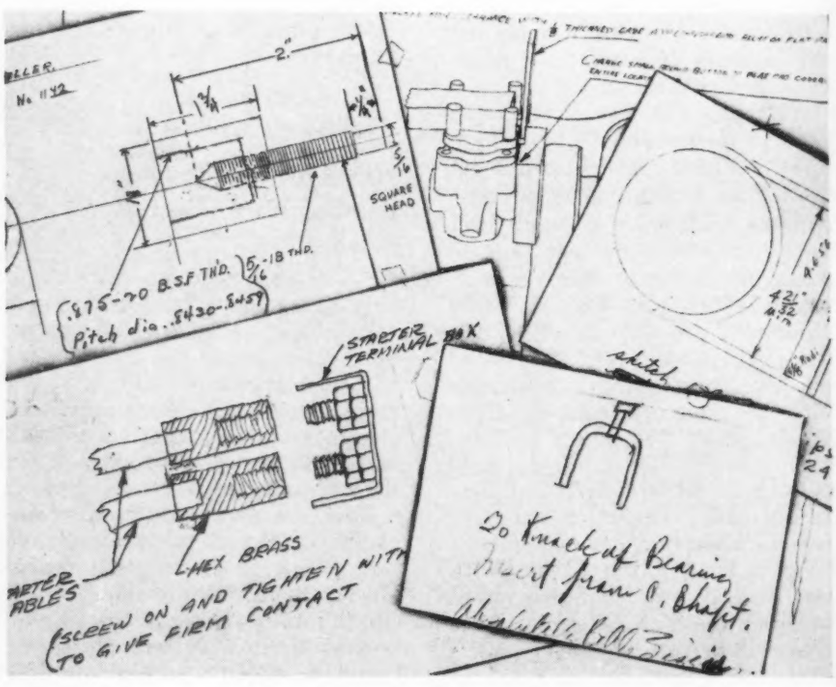
Lack of Pricing Power Slows Scrap Collection

Chicago

• • • **The lack of authority** on the part of OPA regional heads to make decisions on questions dealing with scrap prices remains an important obstacle in the effort to speed the movement of scrap supplies. With scrap dealers faced on one side by WPB demands to speed the turnover of yard scrap and on the other are watched by OPA accountants for infractions of price ceilings, the dealer is put into a very difficult position. On top of this is the fact that the scrap drives are turning up grades of scrap never before seen by a yard and not anticipated by the price ceilings.

With OPA bringing charges for violations involving very technical descriptions, yards are frequently forced to seek an opinion as to what price may be obtained for a certain lot before it can be shipped, or they face charges of misrepresentation on bills of lading or the mill billing. Efforts to obtain opinions from regional offices usually fail and are referred to Washington, a procedure that takes at least a week.

SHOP SUGGESTIONS: When John Hook, Packard war warker, developed this machine to replace an operation he formerly did by hand on a Rolls-Royce aircraft engine gear, he produced in one hour what had previously taken him five to do. The crude but constructive suggestions illustrated are some of the 4158 ideas that have been received in Packard's management-labor drive.



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GEARED

to industry's war needs

Converted to wartime tasks, American industry requires and calls upon us for information about alloys. Quickly available are practical answers to your questions about the selection, fabrication and uses of ferrous and non-ferrous materials containing Nickel. • Even before World War I, this Company pioneered studies of special alloys that provide added strength, toughness and wear-resistance. Our years of experience have been digested into printed reports and data sheets that help you save time and material. • Now, with all Nickel allocated where it may best speed Victory, our studies of alternative materials and processes become especially useful. • Upon request, personal assistance from our technical staff supplements the data in our printed bulletins.

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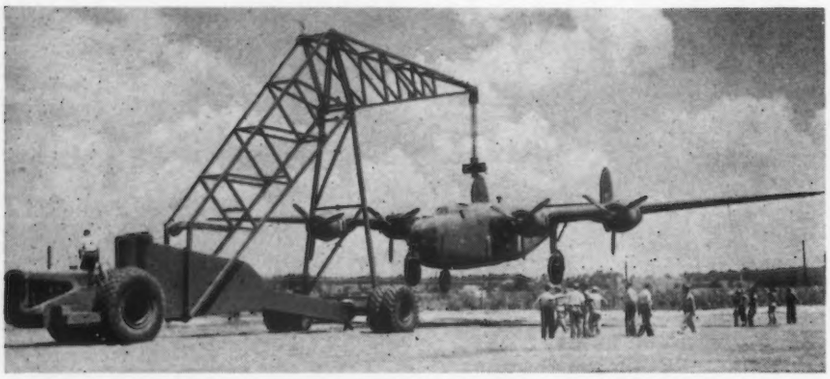

AIRCRAFT CRANE: A mobile crane picks up a B-24 bomber to demonstrate the effectiveness with which the device can be used to clear runways. The crane is 39 ft. high, the front tires 8 ft. in diameter.

Penn Metal to Celebrate Founder's 100th Birthday

Philadelphia

• • • **Penn Metal Corp. of Penna.,** Philadelphia, will celebrate the 100th anniversary of the birth of its founder, L. Lewis Sagendorph, beginning in September. The company was founded by Mr. Sagendorph, at Staunton, Va., in 1869 and later moved the business to Philadelphia at which time the present name originated. Penn Metal is at present working 100 per cent on government orders.

Bethlehem Makes Award For Wire Rope Plant Addition

Williamsport, Pa.

• • • **Lundy Construction Co.** has received a contract for a one-story addition to the Williamsport Wire Rope Division plant of Bethlehem Steel Co.

Versatility
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UNDER VARIOUS CONDITIONS
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Contractors' Equipment To Be Surveyed by WPB

Washington

• • • **The taking of** a nationwide inventory of used construction machinery to make it available for war use was announced Aug. 5 by WPB. The survey will be carried out by the Used Construction Machinery Section of the WPB Construction Machinery Branch and was decided upon because of the increasing demand for emergency assistance in this field.

Recently, a WPB spokesman said a contractor who had just 30 days to complete runways for an air training base was unable to obtain heavy motor graders. Second-hand graders were found for him in time to complete the contract and put the runways in use when needed. Heavy cranes, shovels and other equipment have been located and directed to war use. The demand continues to increase as the output of construction machinery declines.

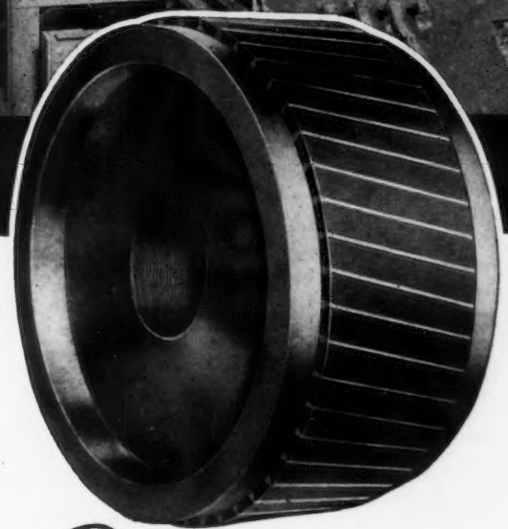
It is estimated by the branch that there are more than 500,000 pieces of vitally needed construction equipment throughout the country, many of them not in use or used but little.

A construction machinery specialist will be appointed for each of the WPB regional offices and will be in charge of the inventory in that region. Inventory cards will be mailed to each owner of such equipment for a complete listing.

A complete inventory of available equipment will be kept at each regional office for the information of the Army, Navy, governmental agencies and private contractors engaged in war work.

Because the productive capacity of construction machinery is in direct ratio to its condition of repair, the section recently has completed a comprehensive survey of repair and service facilities throughout the country. This survey of 400 establishments shows there are more than 2,000,000 sq. ft. of shop space available, 300 skilled repairmen and some $13,000,000 worth of repair parts in inventory. Each regional office will have a breakdown of this information.

A battery of Fairbanks-Morse totally enclosed fan-cooled motors with the exclusive Copperspun rotor driving polishers and buffers for the Kalamazoo Plating Company.



Copperspun

Yes, Fairbanks-Morse Motors are built to stand up under the most severe plugging and reversing service. Only in F-M Motors can you get rotor windings centrifugally cast of COPPER!

Exercise your priority to get F-M Motors, and you'll be assured of dependable, economical, production-speeding power—not only now but also in the years to come.

For an opportunity to compare F-M and other motors, construction point by point, write Fairbanks, Morse & Co., 600 S. Michigan Ave., Chicago.

FAIRBANKS-MORSE

MOTORS
DIESELS
SCALES
PUMPS

Slashing of Expansion Programs Less Drastic Than Planned

Washington

• • • **The $20,000,000,000** war plant expansion program which WPB announced would be cut substantially to save materials for an all-out war effort this year and next, will only be cut about 8 per cent, THE IRON AGE learned recently. WPB recommended that a 25 per cent cut be made, but this has been vetoed by the armed services.

A high ranking WPB official says that one unfortunate aspect of the paring of new facility building is that the deferment of raw material expansion such as in iron and steel is more than the abandonment of munition factories. This, according to the same spokesman, will further unbalance raw material supply, so that many factories now on the list to be completed will be idle when finished lacking material to process.

It was revealed that WPB was ready to make recommendations that plants which were as much as 50 per cent complete be abandoned in an attempt to balance the program. But military chiefs have been deaf to the plea.

This simple idea saves *tons of steel* and thousands of dollars

SEVERAL years ago, Millers Falls engineers went to work on an idea that's paying the country generous dividends today . . . dividends in part money, but more important, in desperately needed steel, transportation, storage space, handling, and paper work. The idea was just this:

A full 50% of the potential cutting power of every hack saw blade was wasted because only *one* edge of a blade was a cutting edge. If teeth could be put on the second edge, there would be savings in everything but the actual milling of the teeth. Prime obstacles were drag and wear on the trailing edge. Intensive experimenting solved the problem with a special "set" and special heat treating. After thorough tests, the new two-edged blade was put on the market at a price only 50% above single-edge blades.

That was 18 months ago. Now Millers Falls "Double-Life", the high-speed molybdenum alloy blade, is proving its value. In almost every plant where Double-Life is given thorough tests, it becomes the standard specification for machine sawing.

This simple idea is saving America thousands of dollars and tons of vital steel.

MILLERS FALLS TOOLS

Millers Falls Company

Manufacturers of Fine Hack Saws, Precision Tools, Hand Tools, and Portable Electric Tools

Greenfield, Mass.

Army Transportation Corps Formed for Supply Services

• • • **Creation of** the Army Transportation Corps of the Services of Supply, to coordinate, direct, and speed the flow of men, equipment and supplies into the war effort was announced Aug. 6 by the War Department. The Transportation Corps will absorb the functions of the Transportation Service, which was created as part of the Services of Supply established March 9.

New Lamps for Old Required

• • • **Because the construction** of its Lumiline lamps requires use of critical metals, G-E Lamp Department at Nela Park announces that new Lumiline lamps cannot be had hereafter unless an equal quantity of old Lumiline lamps is turned in.

Idea Exchange Formed By 26 Milwaukee Firms

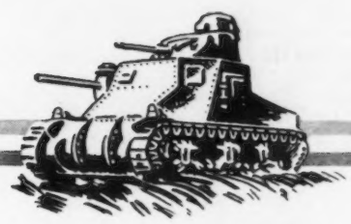
Milwaukee

• • • The Milwaukee Society of Production and Methods Engineers has been organized with 26 firms as members to provide a central exchange for industrial ideas and problems. Officers are George J. Ness, Chain Belt Co.; Carl Schoenbaum, Harnischfeger Corp.; Thomas Leanord, McCullough Engineering Co., and John Finn, Falk Corp. On the advisory board are Franz X. Kartak and William Bliss, dean and assistant dean of Marquette's engineering college; John Graham, Pressed Steel Tank Co.; Alton Dannenberg, Kearney - Trecker Corp., and G. B. Henrichs, Perfex Corp.

TURN IN ALL YOUR

SCRAP

It'll Shorten the War!



LET'S FACE THESE FACTS: Waste materials—scrap metals, rubber and all the rest—are the lifeblood of America's war industry, perhaps of *your own plant!* The demand is great, the supply dwindling. Before we can win, *every pound* of these idle materials must be converted into ships, tanks and guns. Remember this: About one-half ton of steel scrap is needed for every ton of new steel produced.

There may be forgotten tons of scrap in *your* plant. *Put these waste materials to work.* (Steel scrap collected will be purchased by the steel industry at the government-controlled price.)

HERE IS HOW YOU CAN HELP:

1. Name a wide-awake salvage committee chairman for each division and department of your plant. Set up a definite, *continuous* salvage program.

2. Inspect worn-out or obsolete equipment. If it can be used—fine! If not, why not scrap it?

3. Set a plant clean-up day for *every* week. (War machines never stop eating.) Collect everything that is not useful.

4. Separate the scrap — ferrous and non-ferrous metals, for example. Then call the scrap dealer.

5. On plant bulletin boards urge your employees to search their homes and garages for old rubber articles and discarded metal equipment. Then get it to a local Salvage Committee, charity, or junk dealer.

★ ★ ★

The reward is great: American lives saved, a shorter war and a quicker return to your peacetime work. Will you help? The American Rolling Mill Co., 2291 Curtis Street, Middletown, Ohio.

★ ★ ★ ARMCO ★ ★ ★

This advertisement is in support of the Salvage Program of the Bureau of Industrial Conservation, the War Production Board.

The Scrap for Scrap

• • • **PITTSBURGH**—While the local scrap committee here is pushing for inclusion of junkies in all scrap drives, the local defense council material conservation officials plan to use city trucks to collect scrap. Scrap authorities are afraid by-passing of the junkie will reduce his ranks further, thus contributing to the scrap shortage next Winter.

•

• • • **CHICAGO**—Illinois Central System is reclaiming all steel found unnecessary for safety on its road and is removing thirteen miles of guard rail weighing 700 tons. All metal will go to war use. A complete canvass of the system is being made to determine what material can be salvaged.

•

• • • **WASHINGTON** — More harmony is expected between OPA and WPB in the drive to obtain scrap for consumption and inventory. Metal Reserve Corp. is expected to push for action in getting in scrap from West Virginia mines.

•

• • • **OMAHA** — At the end of the first week Nebraska had raised 432 tons of scrap in a statewide drive but at the end of the second week the "take" had reached 14,120 tons with campaign officials, aided by *The Omaha World Herald*, predicting 50,000 tons by the end of the contest. The collection setup is unique. Red Cross block chairmen warn residents to have scrap ready, Boy Scouts and Girl Scouts ring doorbells telling trucks are coming, after the trucks pickup Camp Fire Girls report any scrap missed and finally at the end of the drive a last pickup will be made.

• • • **PHILADELPHIA**—A proposal here that the Government pay a subsidy of $1 or $2 a ton for all scrap moved before the end of September has met with some support here. Proponents claim that it would help build up winter stockpiles and would not be inflationary because the subsidy would be removed after the appointed date. Two objections are cited: one, that it might cause allocation on a large scale and thereby increase scrap freight costs; two, that OPA would frown on the plan as a wedge in scrap price ceilings.

•

• • • **NEW JERSEY** — A politician suggested that householders turn in cast sash weights from attic windows. He claimed ripping up car rails from the town's streets would be too messy.

•

• • • **NEW YORK**—Many tenement house owners would like to remove old fire escapes and the I-beams that formerly supported water tanks, but the cost of burning them off, scaffolding, hoists, compensation insurance, etc., far exceeds their scrap value. It has been suggested here that a government agency undertake their removal or absorb the cost of doing so. Precedent already exists for such action in MRC acquisition of title to 60,000 tons of embedded car tracks in New Jersey.

•

• • • **MILWAUKEE** — City officials have placed their stamp of approval on the reclaiming of buried street car rails now that the material salvaged is to be classed as relaying rails with a price of $30 a ton against $18.75 for scrap rail. About 2,700 tons is available.

Large New Detinning Plant Planned at Buffalo

Buffalo

• • • **A detinning plant** with a large annual capacity is being planned here by the WPB. Negotiations are under way for selection of a site and the Defense Plant Corp. has let the contract to H. K. Ferguson Co., Cleveland.

The plant will be a reception depot for salvaged tin cans from a wide area in New York State, parts of New England, Northern Pennsylvania and possibly Eastern Ohio.

New England WPB to Explain Regulations at Boston Meeting

Boston

• • • **New England manufacturers** and wholesale distributors will receive first hand information on WPB's mandatory Priority Regulation No. 10 and the new allocation classification system, from a group of 12 Washington officials at an open meeting on Aug. 14. The gathering, arranged by the WPB's New England office, is one of a regional series which ultimately will reach to the West Coast.

Government Employment Control Planned in Canada

Ottawa

• • • **So acute** has become the shortage of labor in Canada for essential war industry that the National Selective Service Board is planning to place every employable man and woman in the job where he or she can make the greatest contribution to the war effort. Labor will be rushed to industry in some instances and industry to labor in others. Wholesale use of womanpower will mean establishment on a broad scale of vocational training centers.

The board's plan, called National Selective Service, will have teeth. If persuasion fails, compulsion will be resorted to, with penalties for non-compliance on the part of either the employer or the employee. Under the proposed plan, no employer may discharge an employee, or an employee quit his job, without giving notice in writing, and sending a copy to the nearest employment office for possible investigation and intervention. An effort will be made to level wage inequalities existing across the country.

Prosperous Churches Cause New Canadian Metal Order

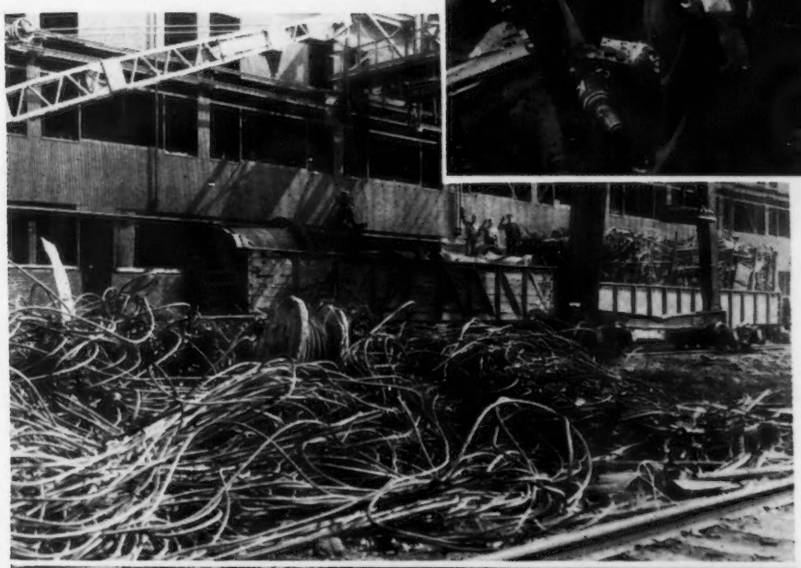
Ottawa

• • • **Canadian manufacturers** of pipe organs must find substitutes for non-ferrous metals, the Metals Controller has ordered. The increased demand for church organs by congregations which have recently improved their financial position is responsible for the new order, which provides that the non-ferrous metals used in organ manufacture must be limited to wire and cable and may not exceed 1 per cent of the value of the completed organ.

Wage and Salary Plan Halted

• • • **The Westinghouse Electric & Mfg. Co.** last week announced its intention to discontinue the company's wage and salary payment plan. "This action," explained A. W. Robertson, chairman, "is necessary on account of recently enacted laws providing for the renegotiation of contracts with the government, and subcontracts relating thereto, and the refund of profits, which will prevent the company from reporting definite figures monthly or even yearly."

Steel From Relics Of First World War To Work Again in This



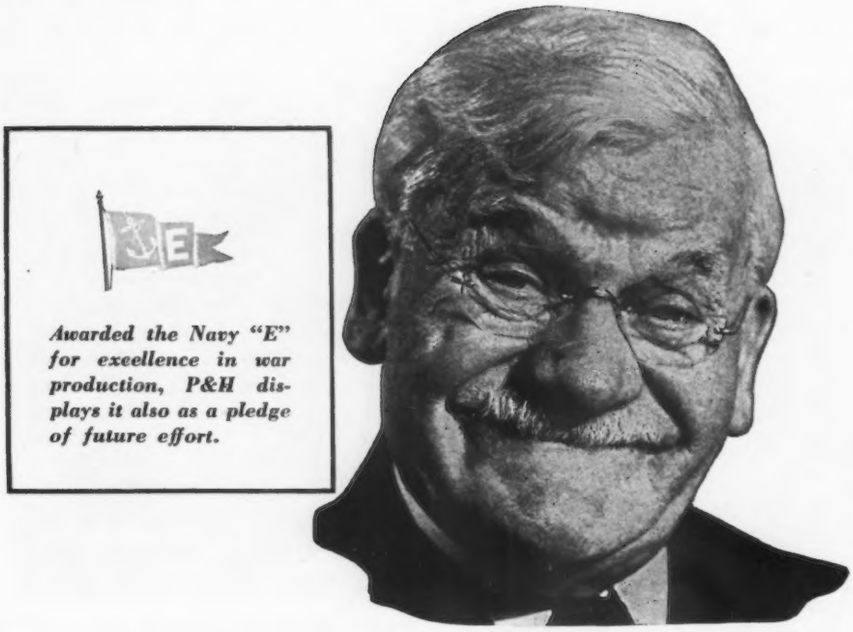
THE CAISSONS ROLL AGAIN: World War I caissons, above, will be charged by the thousands into open hearths at the Carnegie-Illinois South Works, Chicago. Here is Miss Jerry Dillon, a South Works employee, examining the scrap with J. F. O'Brien, superintendent of Open Hearth No. 4.

o o o

OLD HOIST BECOMES SCRAP: Inland Steel Co. ships an old mine hoist, above left, to its Indiana Harbor plants. The old hoist, which lifted thousands of tons of iron ore to the surface during World War I, is shown being loaded on a railroad. Included in the wire in the foreground are the cables used on the old hoist.

THOUSAND-TON PLANT: The Atlantic Refining Company's old asphalt plant at its Point Breeze refinery, above, has fallen under the wrecker's torch. This old Philadelphia plant, built in 1916, is expected to add 1000 tons of steel scrap to the nation's scrap pile.

LAKE SCRAP: Junked cars, right, disposed of in wintertime by driving them onto the ice of a lake in Shawano, Wis., are recovered by Philip Whitman, a farmer. He pays $1.50 per car for the right to haul an estimated 500 jalopies from their watery grave.



Awarded the Navy "E" for exeellence in war production, P&H displays it also as a pledge of future effort.

"Johnny·on·the·spot" I CALLS IT!

"Honest delivery dates mean everything in these days of hurried war production. That's why we cheered when our last Zip-Lift arrived on the date promised. In no time at all we had it plugged in — handling loads 'thru the air' — replacing back power with push buttons — giving production a lift."

And it's "Johnny-on-the-spot" around machine tools, along assembly lines, in foundries, on loading platforms, etc., wherever loads must be handled frequently. Available for bolt, hook or trolley mounting. Ready for use on any standard lighting circuit. It's the quality hoist in the low-price field.

P&H ZIP-LIFT
HARNISCHFEGER CORP. MILWAUKEE, WIS.

CAPACITIES
250, 500, 1000 pounds

General Offices: 4401 West National Avenue, Milwaukee, Wisconsin

HARNISCHFEGER CORPORATION
HOISTS • WELDING ELECTRODES • MOTORS P&H EXCAVATORS • ELECTRIC CRANES • ARC WELDERS

Order with 10,000-Mile Delivery Filled in 6 Days

• • • **General Electric** officials at Schenectady have disclosed what they think may be a record for speedy delivery of Navy equipment to the other side of the world. At 6 p. m. on a recent Thursday an order was received at an eastern G.E. factory for equipment required by a U. S. warship near Australia.

As many workers as could be employed efficiently worked all that night and all the next day and night to assemble the equipment. Escorted by police, it was rushed to a nearby airport and flown westward, arriving in San Francisco on Sunday. On Wednesday, six days after the order had been received, a bombing plane landed the equipment at its Pacific destination, more than 10,000 miles from the factory where it originated.

New July Record Set By U. S. Steel Shipments

• • • **Shipments of finished steel** products by subsidiary companies of United States Steel Corp. for the month of July totaled 1,765,749 net tons.

The July shipments compare with 1,774,068 net tons in June, a decrease of 8319 net tons, and with 1,666,667 net tons in the corresponding month in July, 1941, an increase of 99,082 net tons.

For the year 1942 to date, shipments were 12,269,256 net tons compared with 11,719,544 net tons in the comparable period of 1941, an increase of 549,712 net tons.

July shipments were the highest for that month in the history of the corporation.

Inland Strip Mill Exceeds Former Record by 25 Per Cent

Chicago

• • • **Approximately** enough steel plate for the hulls of two Liberty ships moved out of Indiana Harbor July 30, representing a 24-hr. contribution from the 76-in. continuous strip mill of Inland Steel Co. This mark exceeded by 25 per cent the total of plates shipped when the recent, all-time record was set. More than 75 gondola cars, loaded to capacity with the plates, were started toward the coasts during the 24-hr. period. This same mill set a new all-time shipping record less than a month ago.

Who Is He?

Amory Houghton

• • • **Amory Houghton,** new director general for operations of WPB, and former board chairman, Corning Glass Works, Corning, N. Y., has what it takes on his new job, having really started at the bottom and worked up in the glass company, even though his dad headed it. Before he was made assistant to the president in 1926 he got several years of hard licks in practically every department of the glass works. He was unusually popular with all the workmen and today numbers many of them as good friends. Experience gained in working out problems for himself on the way up has given him the background and the frame of mind to see what American Industry is up against in going full tilt on war work. One thing his friends will shout is that Amory Houghton is "No stuffed Shirt."

Ohio Crankshaft Ahead of Contract Capacity by 50%

Cleveland

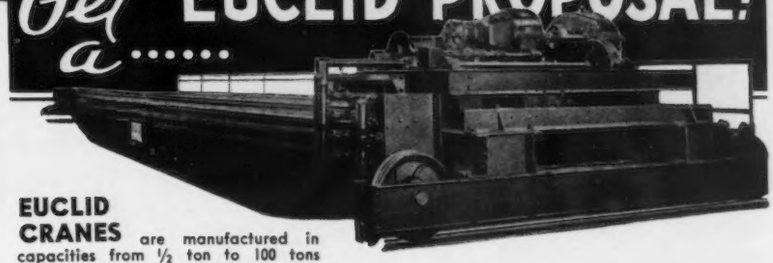
• • • **A war production record** was revealed Aug. 6 by Ohio Crankshaft Co. when William C. Dunn, president, announced that output of aviation engine crankshafts by the company's year-old aviation division was ahead of contract capacity by as much as 50 per cent.

An outstanding machining record, it was achieved within a year from the date of the shipment of the first trial shaft from the company's new $5,000,000 war subsidiary, output of which is now estimated as having reached four figure proportions. Significance is lent this record by the fact that hundreds of precision operations are required to complete each piece.

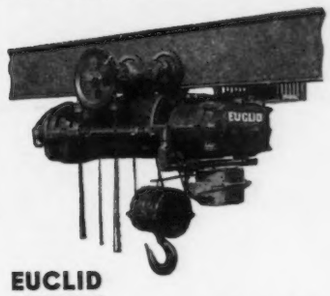
A third sizable war addition, now under construction by the company, in conjunction with the Defense Plant Corp. will boost capacity many times.

need hoist or crane?

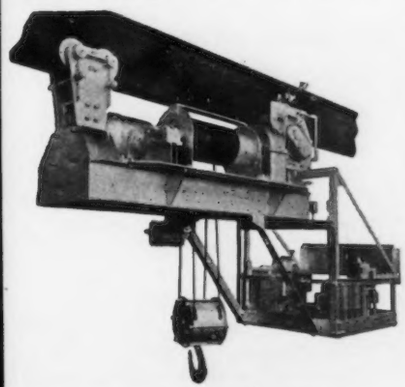
Get a..... EUCLID PROPOSAL!

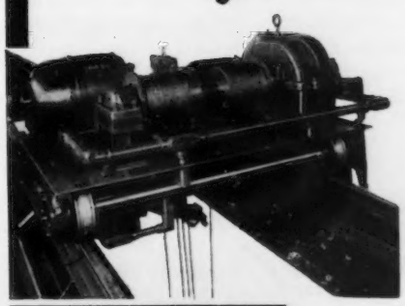


EUCLID CRANES are manufactured in capacities from ½ ton to 100 tons and in spans up to 100 ft. One, two, three, four and five motor electric cranes are built for various classes of service—also a complete line of hand power cranes.



EUCLID HOISTS are available in all types and in capacities from 500 pounds to 20 tons; also in special units built to order, to meet special requirements.





EUCLID has the background of 50 years' experience in building material handling equipment and an impressive record of repeat orders from steel plants, automotive factories, rolling mills, etc.

Euclid Cranes and Hoists are built to serve quietly and efficiently for many years—with minimum attention and repairs.

In all details they embody design and construction that appeals to the critical mechanical mind. They confirm the judgment of users by rendering reliable year after year service.

These statements can be confirmed by referring to The Euclid Crane & Hoist Catalogs which show in detail the construction of all important parts. An effort has been made to anticipate the questions that occur to prospective purchasers.

Copies of either or both catalogs will be mailed on request. Write for them.

EUCLID CRANES & HOISTS

THE EUCLID CRANE & HOIST CO.
1361 CHARDON RD. EUCLID, O.

Faster Driving • Less Effort • Better Work = 50% Less Assembly Cost with Phillips Screws

It seems reasonable to expect more production and better work from a man who doesn't have to sweat and strain (and curse) in order to drive a screw.

Plants which have switched over to Phillips Recessed Head Screws do find that quantity and quality both respond nicely to the change. The Phillips Screw clings to the driver, transmits driving power more efficiently, prevents screwdriver slippage, drives straight automatically and doesn't chew up when you start to drive it home. On top of that, it is more often practical to use electric or pneumatic drivers.

With so many nuisances and strength-wasters eliminated, operators do better work, even in awkward positions or even if inexperienced. Where accuracy is important, it is easier for them to line the job up right — seat the screws securely — and avoid costly rejects.

So keep your men cool as cucumbers with Phillips. Meanwhile, you'll be pleased as Punch to find that assembly costs are cut in half as a result of Phillips Screws.

Any of the Phillips Recessed Head Screw manufacturers listed below can furnish screws and facts.

PHILLIPS RECESSED HEAD SCREWS GIVE YOU 2 for 1 (SPEED AT LOWER COST)

WOOD SCREWS • MACHINE SCREWS • SHEET METAL SCREWS • STOVE BOLTS • SPECIAL THREAD-CUTTING SCREWS • SCREWS WITH LOCK WASHERS

American Screw Co., Providence, R. I.
The Bristol Co., Waterbury, Conn.
Central Screw Co., Chicago, Ill.
Chandler Products Corp., Cleveland, Ohio
Continental Screw Co., New Bedford, Mass.
The Corbin Screw Corp., New Britain, Conn.
International Screw Co., Detroit, Mich.
The Lamson & Sessions Co., Cleveland, Ohio
The National Screw & Mfg. Co., Cleveland, Ohio
New England Screw Co., Keene, N.H.
The Charles Parker Co., Meriden, Conn.
Parker-Kalon Corp., New York, N.Y.
Pawtucket Screw Co., Pawtucket, R.I.
Pheoll Manufacturing Co., Chicago, Ill.
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N.Y.
Scovill Manufacturing Co., Waterbury, Conn.
Shakeproof Inc., Chicago, Ill.
The Southington Hardware Mfg. Co., Southington, Conn.
Whitney Screw Corp., Nashua, N.H.

Swedish Pig Iron Output Reported Up 15% with War

• • • **A 15.7 per cent.** increase in pig iron production in Sweden during the first full year of the war is reported by the *Foreign Commerce Weekly*. Production in 1940 amounted to 745,127 metric tons, compared with 644,038 in 1939. Electric steel produced in 1940 increased to 320,264 tons from 293,608 in 1939. Production of 1,145,064 tons of steel in 1940 was practically the same as output during the previous year of 1,151,914 tons; that of hot rolled iron and steel products also remained practically unchanged—735,280 tons against 736,635 in 1939.

Baldwin Southwark Testing Machine Orders Hit Peak

Philadelphia

• • • **Baldwin Southwark** division of Baldwin Locomotive Works booked 67 orders for testing machines in July, two more than in all of 1939, the best previous year. Testing machine orders for the first six months of 1942 totaled 185, compared with 105 for the first six months of 1941.

No More Electric Toasters, Fans, to Be Made in Canada

Ottawa

• • • **Manufacture in Canada** of electric toasters, electric irons or electric fans will be prohibited after Aug. 15, the Department of Munitions and Supply has announced, rescinding a previous order permitting the manufacture of toasters, irons and fans up to 50 per cent of the 1940 production. The order permits continued manufacture of repair parts. Manufacture previously was forbidden of much electric cooking equipment.

To Launch 6 Ships Same Day

• • • **Six ships** will be launched at the Todd-Bath Iron Shipbuilding Corp., South Portland, Me., yards Sunday, Aug. 16. The Todd-Bath yard will launch five ships and the South Portland Shipbuilding Corp. the other. Two coastal transports were launched Saturday at two Maine shipyards, the APC-13 at the H. G. Marr Yard, Damariscotta and the APC-18 at the Camden Shipbuilding & Marine Co. yard.

DIGGING FOR SCRAP: Philadelphia wreckers digging into the pavement to recover 100 tons of steel and iron in the underground refrigeration room of a department store. The operation was developed by the special projects salvage section of the WPB.

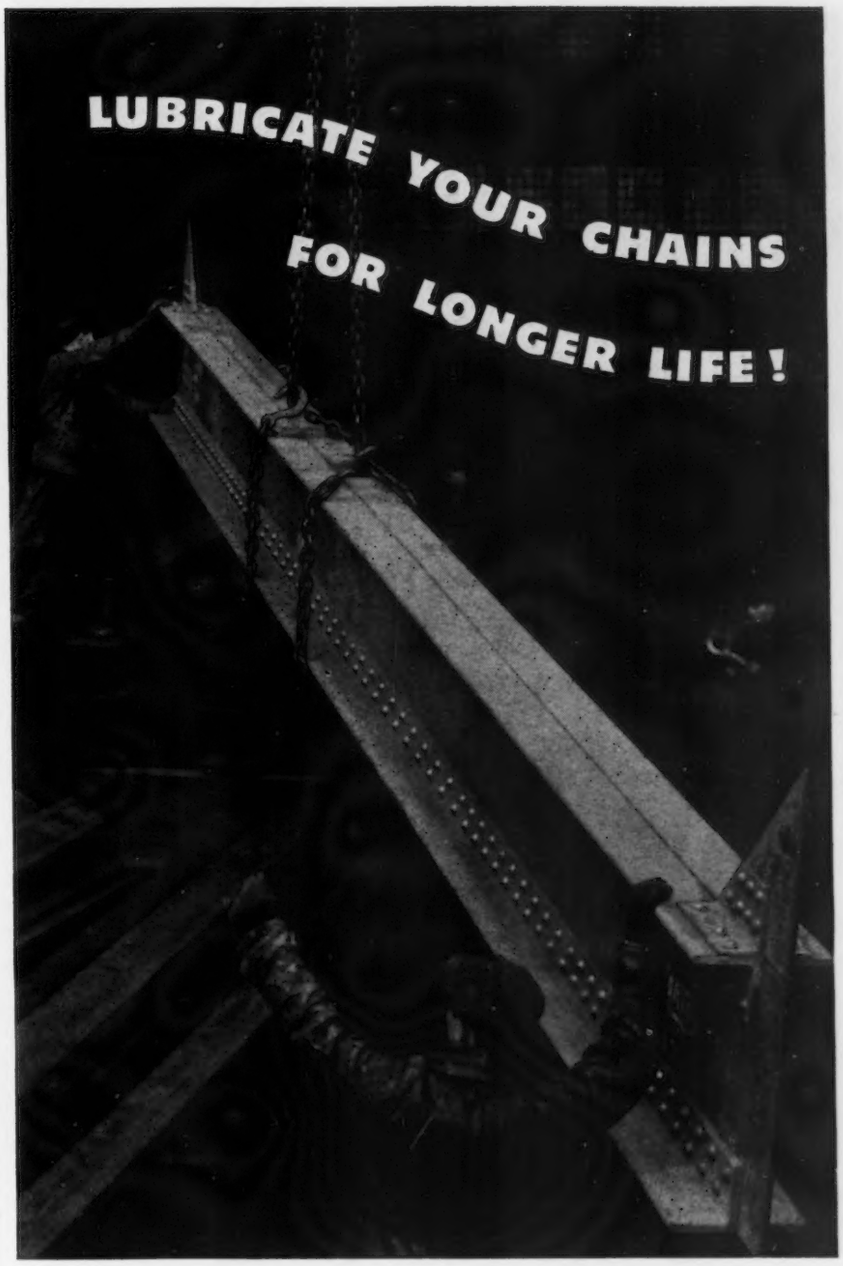
Tugboat Substitute Produced by Chrysler

Detroit

• • • **An entirely new** type of marine propulsion unit that will provide cheap and efficient locomotion to barges, scows, and other flat-bottomed cargo carriers has been developed by David A. Wallace, president of the Chrysler Division of Chrysler Corp.

In place, the units are an integral part of the carrier, as rigid as the general hull structure, and can be easily attached or detached. Two of the units can be used on one barge, if desirable. Barges thus equipped can move as quickly as if towed by a tug and have the maneuverability of an independent vessel. The building cost of the units is about 5 per cent of that of an average sized tug, and the operational cost is much less since only one man is needed to operate each tractor.

These marine tractors, now in production at Chrysler, are adaptable for any type of water transportation except where there is a risk of men being swept overboard by heavy seas.



● We have made chains, for many uses, for many years. We have worked in our laboratories and plants to make good chains which last a long time, and we have consulted with our customers to make those good chains last still longer.

All this experience indicates that **LUBRICATION** is one of the easiest ways to lengthen chain life. Chain lubrication takes little time, shows big returns.

Explain these points to your men:

1. Clean chain regularly.

2. Remove rust, dirt and grit at inter-link points to prevent excessive wear.

3. Lubricate chain operating over drums or sheaves—this will lengthen its life.

4. Use grease or heavy oil mixed with graphite as a lubricant.

5. Keep chain slack when applying lubricant. Brush lubricant well in between the ends of links.

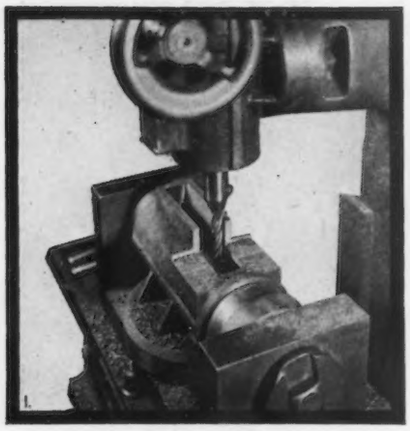
Additional information on the *selection, application, use, inspection* and *maintenance* of chain will be sent on request.

AMERICAN CHAIN DIVISION

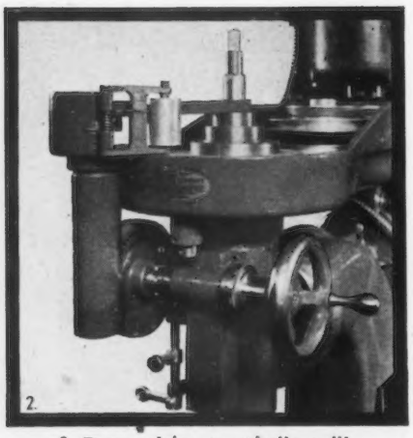
York, Pa., Boston, Chicago, Denver, Detroit, Los Angeles, New York, Philadelphia, Pittsburgh, San Francisco

In Business for Your Safety

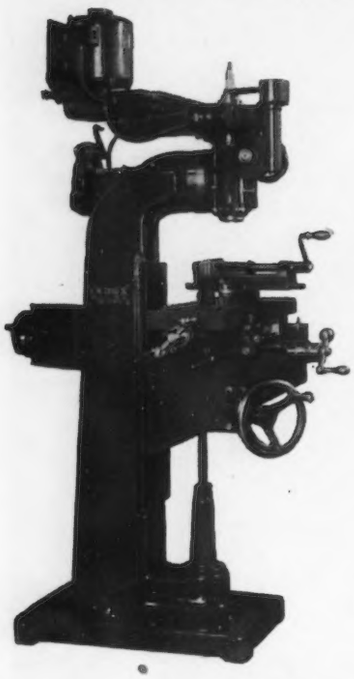
AMERICAN CHAIN & CABLE COMPANY, INC.
BRIDGEPORT, CONNECTICUT

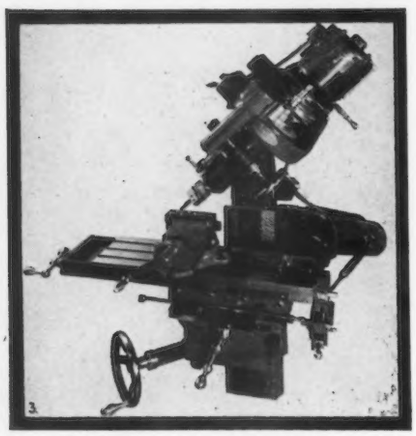


1. Precision end-milling



2. Power drive to spindle quill





3. Head swivels 90° each way

40-H INDEX

Manufactured by

INDEX MACHINE & TOOL COMPANY

A Good High Speed Vertical Miller PLUS

It has a spindle running in super precision ball bearings and equipped with #9 Brown & Sharpe taper.

It will mill with end mills 1/8" to 5/8" in tool steel, will bore a 3" hole in steel with a fly cutter and has verniers for locating. Area capacity 8" x 16" at one setting.

Users in hundreds of defense plants say it is the outstanding machine of its class.

Sole Distributors

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40-H INDEX

A Tried and Proven Machine for Milling, Drilling and Boring in the Tool, Die, Experimental and Production Shops

Study on Collective Bargaining Published

• • • **Improvements in management in the steel industry have been as important as technological changes in cutting steel costs, according to the Twentieth Century Fund's study of labor - management relations. "How Collective Bargaining Works," published Aug. 10. Job analysis and classification and more careful selection and training of employees are among the improvements which, it is stated, have kept steel production costs level, while wage rates have risen about 25 per cent since 1936.**

In addition to the steel industry, the Fund's book contains studies of collective bargaining in the building construction, coal, railroad, automobile, rubber, and electrical products industries, covering such subjects as union organizing tactics and strategy, bargaining methods, and financing. A statistical section gives membership figures of all CIO, AFL and unaffiliated unions.

William H. Davis, chairman of the National War Labor Board is chairman of the committee in charge of the study. Frederick H. Harbison, formerly with the University of Chicago and now a member of the WPB, did the section on steel.

Another recently published book, "Patents and Industrial Progress," by George E. Folk, patent adviser to the National Association of Manufacturers, contends that patent rights are not in conflict with anti-trust laws. The book analyzes recommendations for patent legislation made by Thurman Arnold, Assistant Attorney General, and discusses the role of patents in war production.

Outside Purchases Prohibited

Ottawa

• • • **Thomas Arnold,** Canadian machine tools controller, has issued a new order which prohibits purchase of gages and cutting tools from suppliers outside Canada except by permit in writing from R. T. Wise, director general of the gages and cutting tools production branch and vice-president of Cutting Tools & Gauges Ltd. Mr. Wise also announced that Cutting Tools & Gauges Ltd., a government - owned company, is now prepared to satisfy the Canadian demand for tools and gages.

New Faces, New Places

• • • **Last week** the government announced these appointments among others:

James P. Ward, Chicago, in the typewriter business for 25 years, to Office Machinery and Equipment Section of WPB's Procurement Policy Division, as procurement specialist;

W. C. Kinsolving, Beaumont, Texas, general and operating superintendent of the Sun Pipeline Co.-Yount Lee Pipeline Co. trunk system, to the Petroleum Coordinator's office as assistant director of transportation;

Paul R. Smith, Buffalo, manager of the Buffalo priorities office, to the New York Regional WPB office, as regional priorities manager;

Compton D. Bray, Boston, supervising analyst of the New York Regional office, to the same office as assistant priorities manager;

Harry T. Dixon, Buffalo, member of the Buffalo priorities department, as acting district manager for western New York;

Frank R. Hanrahan, president of Cleveland Railway Co., to Defense Plant Corp. as special representative of the government in the Basic Magnesium Plant, Las Vegas, Nevada.

And in Canada:

Col. W. R. McCaffrey, secretary of the Canadian Engineering Standards Association, to the Department of Munitions and Supply's technical advisory committee on alloy and special steels, as secretary.

Appointed by WPB at Detroit

• • • **The establishment** of an inventory and requisitioning branch in the Detroit regional office of WPB and the appointment of two staff officials to administer its operation was announced this week. C. W. Strawn, vice-president of Bliss Strawn Distributing Co., of Detroit, Toledo, and Grand Rapids, was appointed manager of the branch, and R. L. Grindley, Detroit, was appointed assistant manager. Regional functions of the new branch will be similar in nature to the Washington Inventory and Requisitioning Branch of WPB.

ANDREWS Steel has gone to war! And into these ingot molds go the molten steel that soon will be a part of the tanks, guns, planes, ships and other materials essential to the successful prosecution of the war.

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NEWPORT, KENTUCKY
DIVISIONS
THE NEWPORT ROLLING MILL COMPANY
THE GLOBE IRON ROOFING & CORRUGATING CO.

Basic Open-Hearth Alloy Steel Billets and Slabs

Told in Brief

• • • **Cleveland** — Forty-four papers were accepted last week by the publication committee of the American Society for Metals, for presentation at the National Metal Congress and Exposition in Cleveland, Oct. 12 to 16.

• • • **Washington**—Doubling of the present production of cargo planes to meet the submarine menace was recommended last week by a special committee of WPB experts, Donald M. Nelson reported.

• • • **New York**—The first pool of small contractors under the auspices of the American Contractors War Advisory committee, has been organized here to bid on war orders.

• • • **Louisville, Ky.**—The first of a fleet of 14 new steam freight locomotives built for the Louisville & Nashville Railroad by the Baldwin Locomotive Works at Eddystone, Pa., has been delivered at DeCoursey, Ky., and placed in regular service. Bridges between DeCoursey and Corbin were rebuilt and strengthened to support the heavy engines.

• • • **Washington**—In the four months since the Army, Navy and Maritime Commission have been authorized to guarantee war production loans, more than 800 loans, aggregating about $450,000,000 have been made through the Federal Reserve Bank, acting for the three agencies.

• • • **Schenectady** — More than $63,000 has been paid since Jan. 1 to employees of General Electric Co. for suggestions adopted to speed war production. Of 25,000 suggestions submitted, 7500 have been accepted.

• • • **London**—The prefabrication of steel work accomplished by spreading the work over a large number of units in the British structural steel industry has enabled the British Admiralty to reopen 23 shipyards which have been idle for months, it was announced last week. Other shipyard sites are being used by essential industries.

• • • **Melbourne** — Fifty Australian engineering and manufacturing firms are concentrating on the production of parts for a new 6-pounder anti-tank gun. Parts for the gun are assembled at a central assembly plant indicating Australia's comprehension of mass production methods. It is said, the first of these guns were used against Rommel in the Western Desert.

• • • **Charleston, S. C.**—With the launching, Saturday, of the destroyers Burns and Izard, the Charleston Navy Yard set a new record for destroyer construction of 91 days from keel to launching. This nearly cuts in half their previous record of 175 days, established six weeks ago when the destroyers Bell and Stevens were launched.

• • • **New York**—Electrical wiring of machine tools has been standardized by the American Standards Association, at the suggestion of the National Machine Tool Builders' Association, and the standard made mandatory by the WPB, obviating the necessity for as many as 20 or 30 pages of specifications on wiring of one tool.

• • • **New York**—In place of copper wire for distribution systems, electric utilities are installing "iron wire," triple strands of steel, twisted like manila cord, and so strong it can be strung from poles 600 ft. apart without breaking under winter ice loads.

• • • **Pittsburgh**—H. C. Frick Coke Co.'s mine at Ronco, Pa., has mined more than 2,700,000 tons of coal in three and one half years without a single fatal accident according to Harry M. Moses, president. The employees have been congratulated by Dr. R. R. Sayres, director, United States Bureau of Mines. The mine employs 385 men and the safety record is considered excellent in coal circles.

• • • **Philadelphia**—The Warner Co. will construct a plant to produce magnesite by a newly developed Warner process. The plant will be owned by the Defense Plant Corp. and constructed under a lease-purchase contract.

• • • **Schenectady** — An electronic robot now measures the rate at which metals flow when heated and stressed in the General Electric research laboratory, releasing for other work the attention of a man who formerly watched the metal sample through a microscope. The robot measures an extension of the wire as small as 1/10,000th in.

• • • **East Pittsburgh**—Westinghouse Electric & Mfg. Co. is now subcontracting war work at the rate of more than $100,000,000 a year, with more than 1000 subcontractors in 29 states. Last year the company's subcontract total was $18,777,605.

• • • **Boston**—Possibly taking a cue from the General Electric Co., the Wire Rope Corp. of America, New Haven, Conn., will tear down an adjoining old fire station, and using the material therein, construct a plant addition.

Blowing Engine Situation Easier On New Blast Furnaces

Pittsburgh

• • • **Little has been heard** recently about slow deliveries of blowing engine equipment for new blast furnace units. Closer cooperation between steel companies and engine manufacturers is the answer.

Several months ago it was said that some construction of blast furnaces was being retarded because deliveries on blowing equipment constituted a bottleneck. It was also said that plates were behind on deliveries. Much of this situation has been changed for the good recently.

It was found that some steel companies had placed specifications for blowing equipment, similar to orders placed by other firms but yet different enough so as to require additional work, etc.

Blowing equipment manufacturers explained that if some effort were made to order standardized equipment as far as possible, deliveries could be speeded up.

An attempt was made to get some assurances that standard or uniform blowing equipment would go into new installations. In some cases firms involved, agreed to go along. Others are expected to fall into line, realizing that by this action additional pig iron capacity will be in sooner.

It is also known that some steel companies which had auxiliary blowing equipment have agreed to use this on new blast furnace units when the latter are ready for it and in the meantime order replacements to come along when possible.

In these two moves it is believed that blast furnace installations will be speeded up, a condition urgently needed because of the threatened scrap shortage this winter.

Furthermore when WPB cut down by at least seven units the list of new blast furnaces to be built, it also promised better ratings on some of the units which were retained. More than a year ago it was argued by steel operators that some kind of super-ratings were necessary for blast furnace expansions if furnaces were to come into the production at a time when most needed.

Scenes in Britain As the Third War Year Draws to a Close

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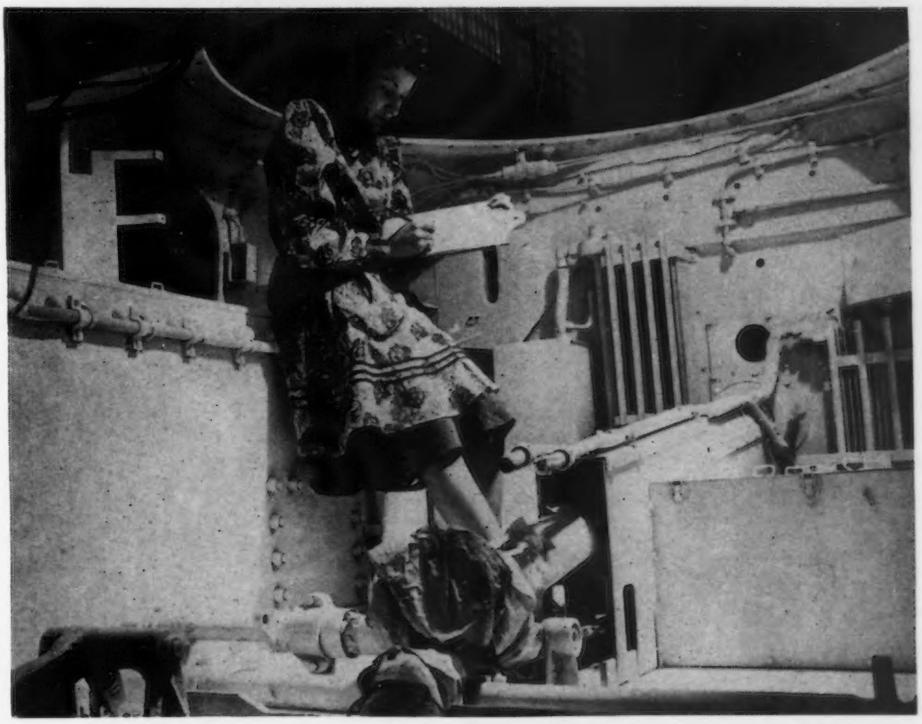


TANK interior enlarged to magnificent proportions by a trick of the camera. By the time all guns and fittings are installed there will be barely room enough to permit the crew to work efficiently. The girl is checking installation of equipment.

o o o

ABOVE

A CANADIAN soldier carries a "Sten" gun. Despite the violent controversy about these weapons they have been issued to Canadian units in England and have been used successfully on recent maneuvers.

o o o

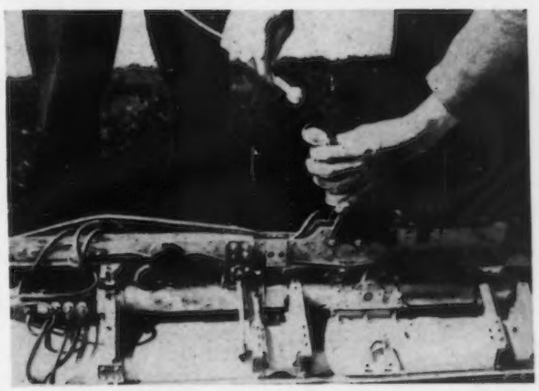
RIGHT

VALENTINE tanks lined up at the plant of a locomotive builder. In England, as in America, Canada and Australia, locomotive plants have been converted into tank arsenals, but locomotive construction continues too.

o o o

RIGHT

R.A.F. personnel prepares firebombs for use in raids over enemy territory. This crew is preparing to hoist the container, attached to its carrier, into a plane by means of a winch.



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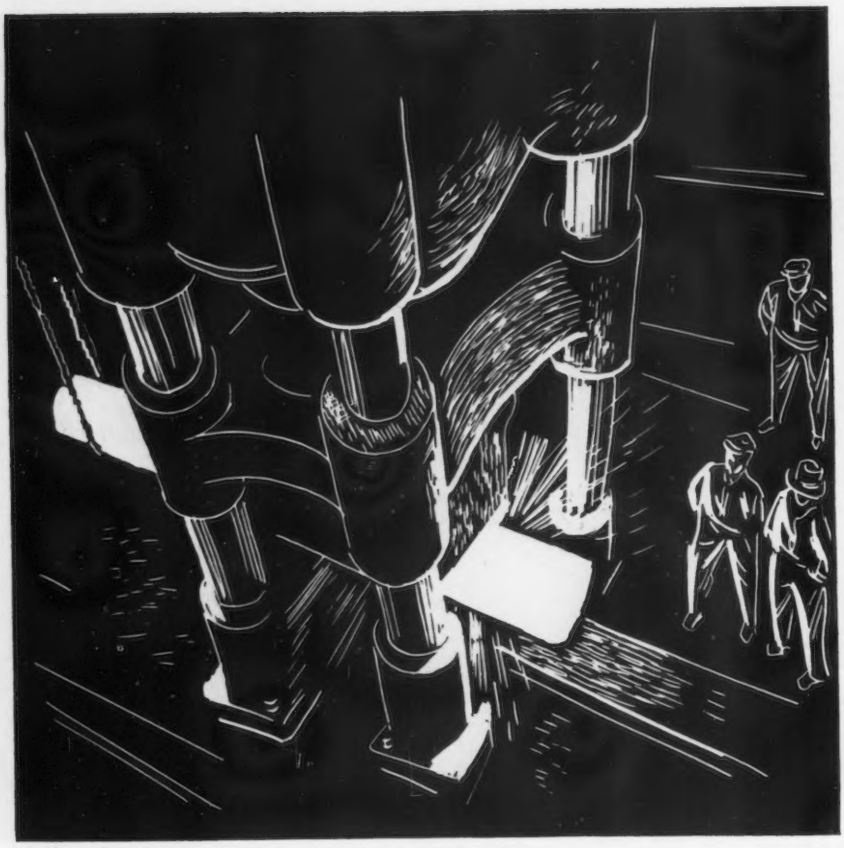

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STANDARD STEEL WORKS

DIVISION OF
THE BALDWIN LOCOMOTIVE WORKS
PHILADELPHIA

Reduction Made in War Risk Insurance Rates

• • • **The War Shipping** Administration on Aug. 6 revealed that at the request of the OPA it had reduced war risk insurance rates covering cargoes imported to the U. S. and cargoes exported from the U. S. to its territories and possessions. With respect to imports the rates named will not apply to goods imported, in bond or otherwise, for re-export to points outside the U. S.

The rates named represent levels prevailing as of January 1, 1942, excepting where current rates named by the WSA are lower than the Jan. 1 rates, in which case the current rate remains in effect. The new rates represent substantial reductions in many trades, particularly those involving U. S. Atlantic, Gulf of Mexico, and West Indies waters.

The rate schedule name is merely a temporary one pending a full study of the situation with respect to various import commodities by the OPA.

The rate schedule named becomes effective with respect to goods shipped under ocean bills of lading dated on or after Aug. 1, 1942. Where goods previously insured by the WSA were actually shipped on or after said date, a return of premium will be made upon presentation of shipping documents or other satisfactory evidence of date of shipment, together with application for return premium in form prescribed by the War Shipping Administration.

Kaiser's Oregon Yard Sets Nation's Shipbuilding Record

Washington

• • • **The Maritime Commission's** report on Liberty ships built up to Aug. 1 names Henry J. Kaiser's Oregon Shipbuilding Corp. yard at Portland as building the most ships, the most ships per way, and a ship in the shortest average time. It has delivered 54 of the emergency cargo ships from eleven ways, with an average construction time of 108 days.

Second place in production time went to another Kaiser yard at Richmond, Cal., with an average production rate of 113 days. Third place, with an average time of 139 days, went to the Bethlehem-Fairfield Shipyard, Inc., Baltimore.

Air Cargo Plan Set

• • • WPB has moved toward the construction of 500 70-ton Mars flying boats as cargo carriers. A 200-ton experimental flying boat also was approved. Henry J. Kaiser was given authorization to prepare and submit engineering plans and material data to be used in the manufacture of 500 Glenn Martin flying boats. Kaiser must show that his program will not interfere with the President's military program.

The U. S. military forces have a sizable fleet of cargo planes, a point not understood clearly by the public. The Curtiss Commando is known as one of the most efficient of all cargo carrying planes. However, it is not in the larger class as represented by the Martin Mars flying boat.

The U. S. since 1930 developed six types of large cargo planes, including the Ford trimotor, but none of them was left in production long enough for any large quantities to accumulate.

By 1940, however, the Army was carrying more freight by plane than all domestic airlines.

In late 1937 the Maritime Commission asked authority to purchase flying boats, but the proposal was not accepted.

Germany got into full production of the Junkers 52 cargo plane in 1930 and 1931, but kept up production and trained its personnel. The plane was of great value in Norway, Crete and Libya.

The principal questions involved in the decision on cargo planes include: Are cargo planes in balance with other parts of the aircraft program and is that program in balance with the tank and gun and ship programs? Will the cargo plane help to provide the U. S. with greater and more immediate striking power against the enemy than other items of war production? Shall alloy steel and tools be taken away from other war items?

Those who have insisted that 200-ton flying boats are feasible maintain that an eight-motor, 20,000 horsepower flying boat, weighing 200 tons gross weight, could carry 50 tons pay load, exclusive of gasoline, for a 3,600-mile range and a cruising speed of 200 miles an hour. Such a boat could make 50 round trips a year over the distance.

To move 450,000 tons of cargo a year, it was added, 180 of the 200-ton planes would suffice, and their construction would require 18,000 tons of raw materials. This is contrasted with the 235,800 tons of raw materials to build the ships and convoys necessary to carry by sea.

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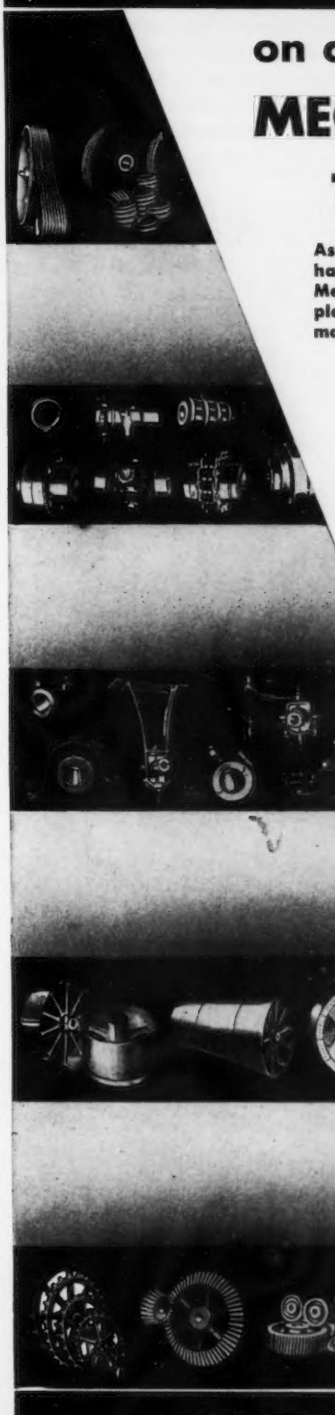

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Auxiliary Ore Route in North Set; Line Begun for Eastern Mine

Washington

• • • **A $20,000,000** to $30,000,000 program providing for the immediate construction of iron ore yards and docks at Escanaba, Mich., and the possible dredging of additional channels at Escanaba Harbor, and immediate improvements through ballasting, tying and the strengthening of bridges of the railroads operating between Escanaba and Superior, Wis., and between Escanaba and Ironwood, Mich., has been approved by WPB, it was announced last Friday. The new ore route, supplementary to the present one through the Soo locks, will be adequate to handle the shipment of 100,000,000 tons of ore annually.

The WPB Transportation Committee which drew up the program pointed out that the ability of boats on the Great Lakes to handle the iron ore trade is being heavily taxed and will be burdened even more heavily as additional lake boats are transferred to salt water. In addition, it was pointed out, the time required for the boats to make round trips would be shortened.

The program is designed to safeguard the flow of iron ore to the mills and to make possible continued shipments of ore from the upper Great Lakes region though the locks at Sault Ste. Marie, Mich., should be closed to traffic.

Approximately 84,000,000 tons of ore will pass through the Soo locks this year and a larger tonnage will be moved in 1943. To move this ore by rail to the steel producing areas around the lower lakes would be extremely expensive and would tie up rail shipment of other war goods. Also it would require rail equipment urgently needed for other purposes. In addition, many furnaces are situated on lake front sites and are not equipped to receive ore by rail.

According to the Office of Defense Transportation, 40,000,000 tons of ore could be moved annually from the Duluth area to the Ohio and Pennsylvania furnaces by rail, and 60,000,000 tons could be moved to Escanaba from the Michigan ranges and from Duluth, either by an all-rail route or by water and rail via Marquette, Mich. At Escanaba, this tonnage can be sent on to the furnaces by boat.

The program is to consume approximately 5000 tons of steel; to be federally financed and is expected to be finished by Jan. 1.

•

Tahawus, N. Y.

• • • **With full scale exploitation** underway and with the first shipment of titanium concentrates having been made over a newly constructed highway, the National Lead Co. development at San-

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YOUR production parts finished by the new Ultra-Lap machine method, to an optically flat surface . . . to specifications for flatness of one light band or less . . . to a smoothness as low as one micro-inch R.M.S. . . . any metal or material, or any combination thereof . . . much faster, more uniform than hand methods.
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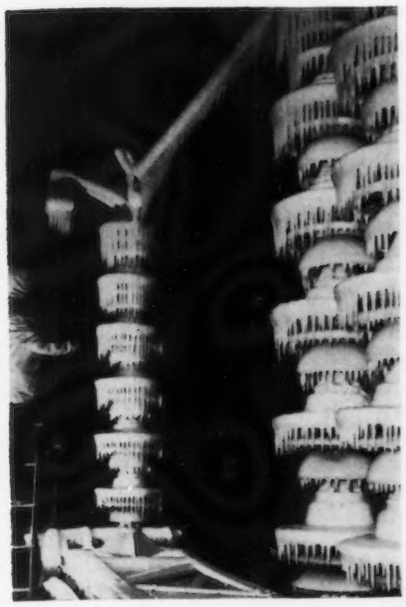

FREEZE-PROOF SWITCH: In 20-below-zero temperature of made-to-order Arctic winter, a hooded engineer tests a Westinghouse power line disconnect switch. It is one of 10 being built for a power line to supply a western chemical plant, and carries 230,000 volts at 1200 amp.

ford Hill area will have additional railroad facilities in about 18 months.

Work has begun at North Creek on the new 30-mile line which will be constructed as a joint program between WPB, the National Lead Co., and the Delaware & Hudson railroad. It will furnish means of transporting iron ore to some of the nations blast furnaces as well as expediting the movement of titanium used in paint manufacture.

The iron ore deposits here represent one of the largest east of the Lake Superior region and are being worked primarily to furnish titanium for the National Lead Co., and other paint concerns interested.

The iron ore is a by-product of the titanium concentration activity and is being stocked. (See THE IRON AGE issue March 5, page 53 for complete history of this large scale development.)

There is little doubt that ready buyers will be found for the iron ore because of increased demand but the railroad will not be completed before the next 15 months and only then if material can be obtained.

Pontiac's Former President To Head Army's Mobile Units

Detroit

• • • **In the recent** reorganization of the Army's services of supply, under the direction of Lieut. Gen. Brehon Somervell, it was announced that Alfred R. Glancy, former president of the Pontiac Motor Car Co., will assume control of the Army's mobile units. His duties will include the direction of purchases, tests, and clearances of all tanks, trucks, jeeps, gun carriers, and other ordnance vehicles, and his headquarters will be in Detroit.

Mr. Glancy has been connected with the Ordnance Department of the Army since the beginning of the OPM, but has maintained a civilian status. He was named as chief of ordnance by Lieut. Gen. William S. Knudsen when he was Director of the OPM.

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Steel Quota Plan Seen Working if Unhampered

Pittsburgh

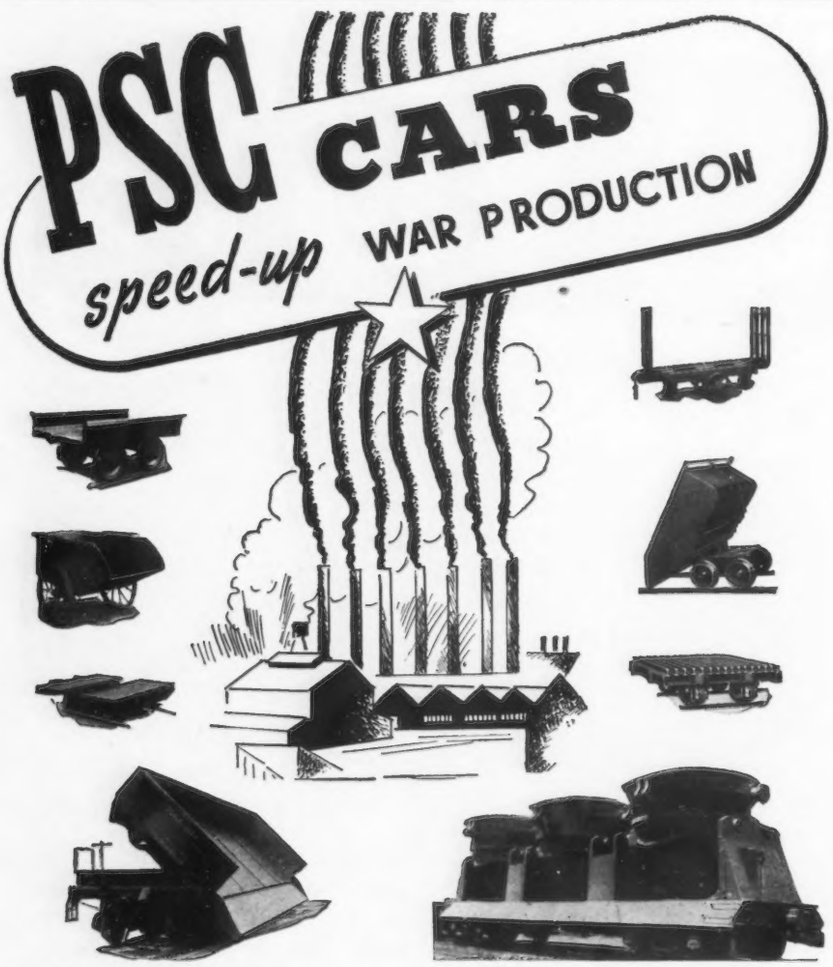
• • • **If not tampered with** or extensively changed, the present quota or directive system for the production of steel products will, according to informed steel mill opinion, iron out many of the alleged distribution problems now confusing to both buyers and sellers.

If the WPB sticks with this plan and continues to solicit the help of steel operators who know what their mills can and cannot do, it is entirely possible that some maladjustments can be remedied from month to month without any impact on the war program which might call forth useless bickering and investigation.

With practically all major steel companies having had their quotas set for August on the production of specified products which are to be distributed and shipped within the framework of the priorities system, evidence will soon be at hand to test the efficiency of the last in a long line of trial and error methods instituted by WPB.

The latest method comes closer to what "those down the line" in steel operating and sales departments believe to be the answer to the production and distribution problem. Especially is this true when it is recalled that before actual August quotas were set for various companies, WPB officials met in conference with operating and sales department representatives of the steel companies involved. There was no attempt at arbitrary direction and if the ideas of the WPB product head were at variance with the stated opinions of the steel company representatives, a solution was obtained.

Whether the end of August will find that too much of one product or too little of another was ordered produced, remains to be seen. But if the quota system plan continues to work from a mechanical standpoint, as it did in



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PITTSBURGH, PA.

COMING EVENTS

July 22 to 24—American Society of Civil Engineers, annual convention, Spokane, Wash.
Aug. 23 to 26—National Association of Power Engineers, New Orleans.
Sept. 1 to 11—Building and Construction Trades Council, Atlantic City.
Sept. 2 to 5—Roadmasters and Maintenance of Way Association of America, Chicago.
Oct. 5 to 9—National Safety Congress Association, international convention, Chicago.
Oct. 7 to 10—The Electrochemical Society, Inc., Detroit.
Oct. 12 to 16—National Metal Congress and Exposition, Cleveland.
Oct. 15 to 17—Federation of Sewage Works Association, New York.
Oct. 16 and 17—War Production Conference of American Society of Tool Engineers, Springfield, Mass.
Oct. 18 to 21—American Public Works Congress, Chicago.
Oct. 19 to 23—Wire Association Meeting, Detroit.
Nov. 17 to 22—National Chemical Exposition, Chicago.
Nov. 30 to Dec. 3—American Society of Mechanical Engineers, annual meeting, Hotel Astor, New York.
Nov. 30 to Dec. 5—National Exposition of Power and Mechanical Engineering, Grand Central Palace, New York.

Water, Not Rubber, Is Policy of Diamond Tool

Chicago

• • • The Diamond Tool Co., Chicago, is using a large power cruiser to transport supplies and traveling tooling engineers between some Great Lakes war plants, according to Sheldon M. Booth, owner. The company's men, who must travel to instruct employees of war plants in the use of tools and machine operation, are thus made available to principal areas without use of rubber.

its initial stage, it will be an easy matter in subsequent months to make up for any deficiencies in one product or another.

For example, if it is found that August quotas were insufficient to take care of total bar requirements, this fact will be readily discernible to the WPB bar product head, and plans can be made to take care of this deficiency in the following months.

Information from reliable sources indicates that WPB officials are rapidly reaching a point where the Iron and Steel branch, at least, is fully cognizant of what each steel company can and cannot do in the way of steel production of certain products. The period of arbitrary directions and orders appears to be over. For example, when a company says that it cannot make so much semi-finished steel and yet get out other obligations the WPB product man in charge knows this to be fact and makes his plans accordingly.

The quota system however is only for the production of steel products and if there are too many wrinkles in the priority pattern these will still be there. There is evidence already that A-1-a priorities are of little value today, and the move to re-rate the more important steel orders to the super-ratings will probably continue for some time. At present, the bulk of steel production and shipments is beginning to fall into AA-1 and AA-2 ratings, which include considerable lend-lease tonnage. While there may have been a disposition to issue AA-2, AA-3 and AA-4 ratings rather easily, there is no evidence yet that the triple A rating has been handed out indiscriminately, which leaves this high rating in the special position of being utilized when extremely necessary.

If the quota system fails of its purpose it will probably be because there has been too much interference, not enough perfection and too little disposition to ask the advice and help of those technicians in the steel companies who know the difference between what can be done on paper and what can be done at the mill.

Kaiser Asks Approval for Two New 40-Ton Electric Units

Washington

• • • **To provide** alloy steel for his projected cargo plane program, Henry J. Kaiser last week requested Washington officials to approve plans for the construction of two 40-ton electric furnaces. The new construction is to cost $4,000,000, and will include bar straightening and turning facilities.

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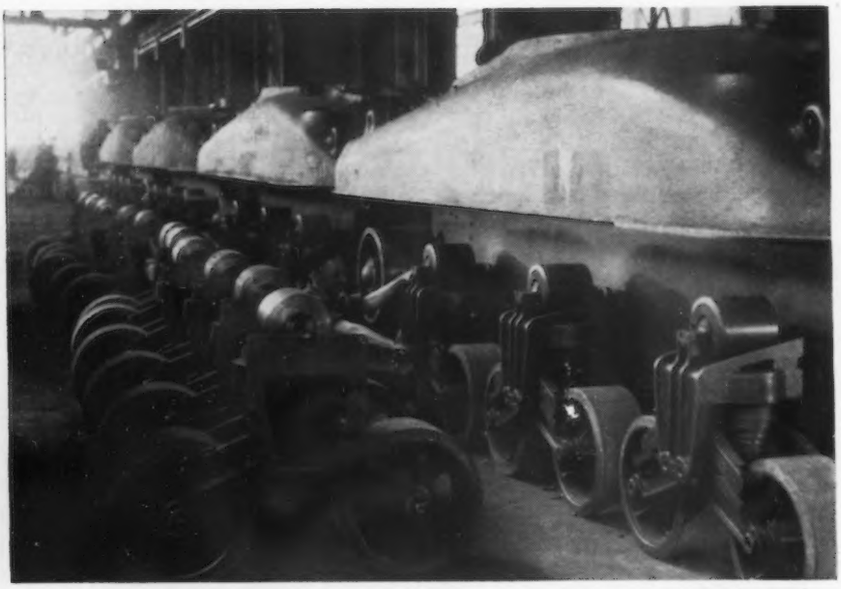
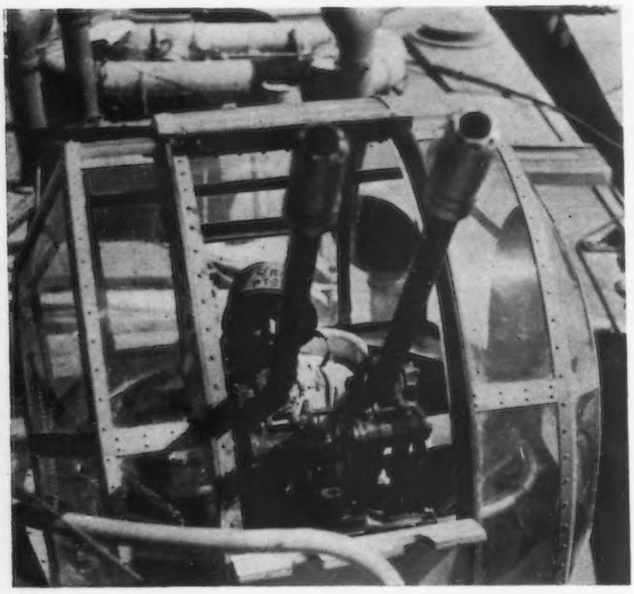
R-S Furnaces of Distinction
BUY WAR BONDS

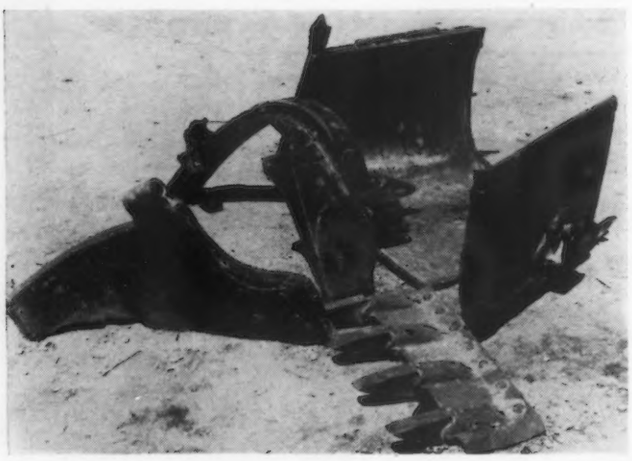


M-4 TANK HULLS: Cast steel gives smooth contours to the hulls of the M-4 medium tank. This unusual closeup was made in an eastern plant and shows the front view of several units with their bogie wheel assemblies.



PT GUNNER: From their nest in a palm-fringed tropical lagoon, the Navy's deadly PT boats patrol Hawaiian waters. Lieutenant Commander Bulkeley's PT squadron in the Philippines used guns like these to shoot down or damage a "notable number of Jap-

° ° °



CUT UP BY THIEVES: Scrap thieves used an acetylene torch to cut an airport contractor's drag line bucket into these pieces, which they sold for scrap. Alert police spotted the parts en route to a mill and shipped them back, where they were welded into their original position with Hobart arc welding equipment.

Engineer Corps Sets Up Price Adjustment Sections

Washington

• • • **Two Price Adjustment** Sections have been created by the Corps of Engineers, Services of Supply, to renegotiate with prime and subcontractors on Army construction and supplies for the Corps of Engineers. Both sections will operate in Washington.

Harry W. Loving is chief of the renegotiation section for the construction division, which is concerned with Army construction and architect-engineer contracts.

Captain W. W. Shoffstall, Corps of Engineers, is chief of the section which will renegotiate Supply Division contracts.

Price Adjustment Sections may also be established in division and district offices over the country in order to expedite the renegotiation program.

"It is not to be assumed by the Corps of Engineers, if a contractor is required to renegotiate a contract, nor even if investigation results in a finding that excessive profits were realized, that the contractor has not acted in good faith with the government," said Major General Eugene Reybold, Chief of Engineers.

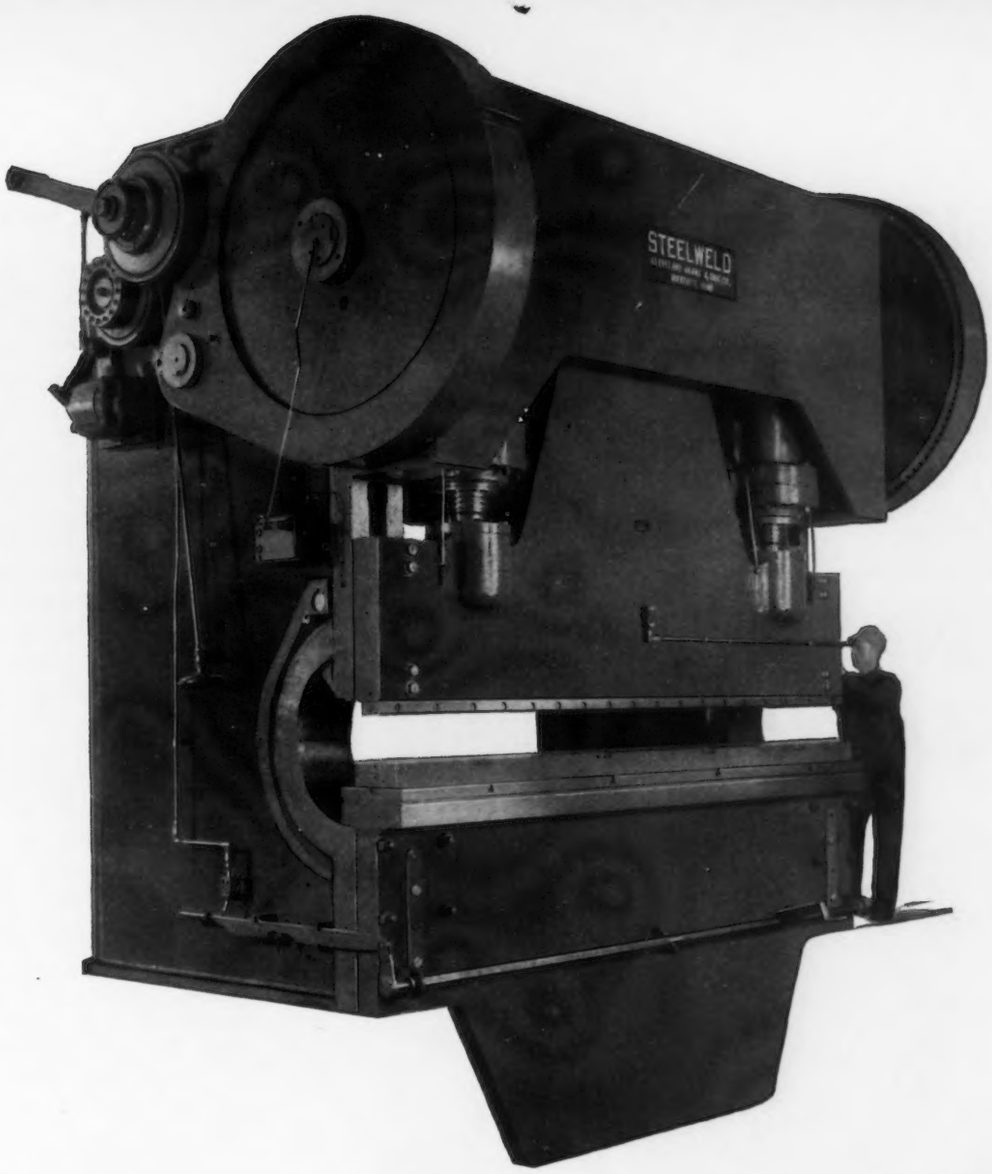
"It is realized that under stress of war, contractors in many instances have been compelled to proceed without all data necessary for an accurate estimate of construction costs," he explained.

Renard Urges Scrap Collection to "Last Ounce"

Washington

• • • **The printing and publishing** industry was called upon by George A. Renard, chief, WPB Printing and Publishing branch, to contribute "to the last ounce" its available scrap materials.

"Thousands of tons of critical metals and other materials are lying idle in the printing and allied service industries in the form of obsolete mechanical equipment, much of which has not turned a wheel in months or years," said Mr. Renard. "Standing on production floors, occupying valuable space, is mechanical equipment that should be scrapped now while an urgent need exists for iron, steel, brass, bronze, nickel, rubber and other critical materials."



TEN feet of one-inch plate can be bent cold with this model P6½-10 Steelweld Bending Press. Three-inch high-tensile heat-treated armor plate can be straightened with it.

Like the entire line of Steelweld Presses it has a one-piece all-welded frame that will remain rigid for life. Because of shipping limitations the bed is bolted to the frame with heavy shear pins taking the working load.

Shafting and machinery are located at rear of the machine, preventing damage from bent-up plates and crane hooks.

Clutch and brake mechanism is electrically operated to reduce fatigue of the operator and speed operation.

Gears are high carbon, heat-treated. Bearings are extra large. Anti-friction bearings are pressure-grease lubricated. Other bearings are automatically oil lubricated.

A tonnage indicator is provided to keep both operator and management informed of the loadings to which the press is subjected.

The P6½-10 and all other Steelweld Presses are equally adaptable to the production of materials of peace or war.

THE CLEVELAND CRANE & ENGINEERING CO.
STEELWELD MACHINERY DIVISION
1115 EAST 283RD STREET • WICKLIFFE, OHIO.

MANUFACTURERS OF • CLEVELAND CRANES • CLEVELAND TRAMRAIL • STEELWELD BENDING PRESSES

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STEELWELD
BENDING PRESSES

GENERAL SALES AGENTS: CYRIL BATH & CO., E. 70TH & MACHINERY AVE., CLEVELAND

Annual Steelmaking Capacity Rises to 89,198,320 Tons on July 1

• • • **According to** the American Iron & Steel Institute, the American steel industry reported facilities as of July 1 sufficient to produce a total of 89,198,320 tons of steel per year, which is probably 50 per cent of the entire steel capacity of the world. As of Jan. 1, 1942, the Institute rated American steel capacity at 88,570,000 tons per year. This figure evidently included capacity which was at that time almost ready to operate.

The present capacity of the industry is almost half again as large as steel capacity in this country at the close of World War I, and is one-third greater than the maximum tonnage of steel which the industry was called upon to produce in any year prior to 1941.

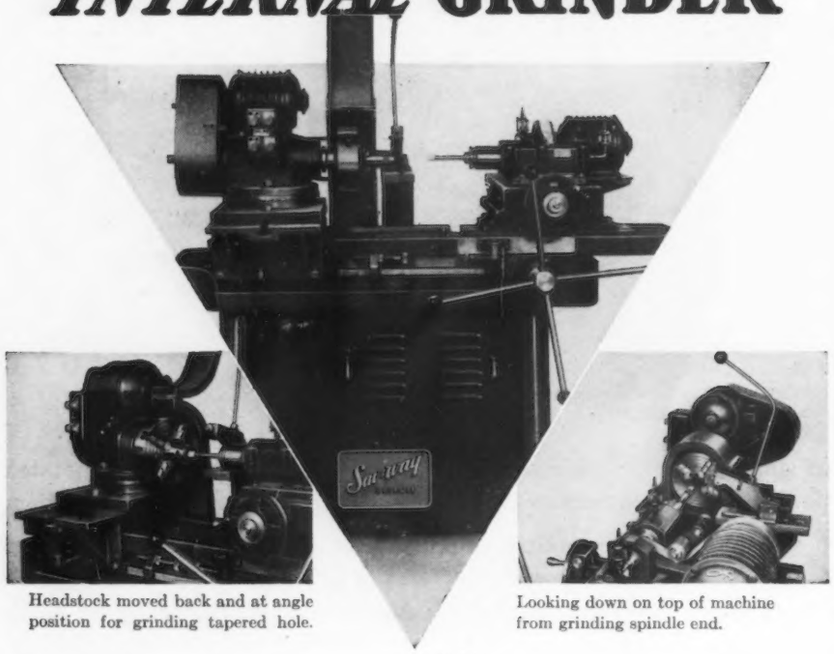
Since the outbreak of war in Europe, the steel industry of the United States has increased its annual capacity by nearly 8,000,000 tons.

Electric furnace steel capacity on July 1 was equivalent to a total of 4,225,890 tons per year.

Bessemer steel capacity as of July 1 of this year is rated at 6,721,400 tons per year, unchanged since Jan. 1.

Blast furnace capacity as of July 1 of this year is rated at 60,816,480 tons per year, the highest in history.

Saw-way MULTI-PURPOSE INTERNAL GRINDER



Headstock moved back and at angle position for grinding tapered hole.

Looking down on top of machine from grinding spindle end.

Offers greater flexibility . . . a precision grinder, designed and built by engineers with years of practical experience to guide them . . . has a headstock traverse of 6″ . . . grinds holes ¼″ to 18″ in diameter . . . holes up to 9″ deep, straight or tapered . . . entire headstock may be moved at right angle to wheel traverse, by merely loosening two conveniently located nuts . . . worm compensating device permits grinding wheel head adjustment to .0001 . . . sturdy construction throughout . . . full specifications, delivery time and price on request.

Distributors throughout the U. S. and Canada to serve you.

Saw-way TOOL AND MACHINING CO.
13834 JOS. CAMPAU AVE. DETROIT, MICHIGAN

Corundum, Three Other WPB Advisory Groups Named

• • • **The formation** of additional industry advisory committees was announced Aug. 3 by T. Spencer Shore, chief of the division of industry advisory committees. They are:

Carbon and graphite electrodes industry—M. H. Billings is government presiding officer. Committee members are: H. S. Conrad, Stackpole Carbon Co., St. Marys, Pa.; Ralph M. Hunter, Dow Chemical Co., Midland, Mich.; Andrew Kaul, III, International Graphite & Electrode Corp., St. Marys, Pa.; Harry P. Martin, Acheson Graphite Corp., New York; Henry L. Walker, Jr., Great Lakes Carbon Corp., New York.

Corundum industry—R. J. Lund is the government presiding officer. Comittee members are: George P. Brockway, American Optical Co., Southbridge, Mass.; Sydney Hermant, Imperial Optical Co., Toronto, Ontario; Louis M. Fuller, American Abrasives Co., Westfield, Mass.; J. E. Hansen, Bausch & Lomb Optical Co., Rochester, N. Y.; S. Preisman, Renaud Optical Co., Webster, Mass.

Heavy forged tool industry—John L. Haynes is the government presiding officer. Committee members are: A. K. Anderson, Martin Hardsocg Co., Pittsburgh; William H. Baldwin, Warwood Tool Co., Wheeling, W. Va.; Frank L. Campbell, Fayette R. Plumb, Inc., Philadelphia; M. A. Coe, Stanley Works, New Britain, Conn.; A. C. Laessig, Woodings-Verona Tool Works, Verona, Pa.; Thron Pendleton, Warren Tool Corp., Warren, Ohio; J. Louis Wenzel, Hubbard & Co., Pittsburgh.

Industrial power truck industry — Graeme Darling is the government presiding officer. Committee members are: Eugene Caldwell, Williamette Hyster Co., Portland, Ore.; Ezra Clark, Clark Equipment Co., Battle Creek, Mich.; D. L. Darnell, Baker-Raulang Co., Cleveland; C. D. Eller, Crescent Truck Co., Lebanon, Pa.; L. J. Kline, Mercury Mfg. Co., Chicago; Milton G. Peck, Yale & Towne Mfg. Co., Philadelphia; C. E. Smith, Towmotor Co., Cleveland.

PRP to Go on Product Basis First Quarter of Next Year

Washington

• • • **For the first quarter** of 1943, WPB is going to put the Production Requirements plan on a product basis, THE IRON AGE is told. This means that if a manufacturer is making 10 products, he will have to file 10 priority applications. WPB's objective is raw material bills for products so that it will be possible to restrain or stimulate production and know how it affects material supply.

A further reason is that under the present setup, the various WPB industry branches are having jurisdictional fights over the forms. Whenever a plant submits a PD-25-A to cover the production of a number of products, and two branches have jurisdiction over different products, a tug of war results to see which branch should process the application. Individual product applications, it is felt, should solve this difficulty.

Priorities men say they are not satisfied with the way PD-25-A processing is being done, and declare that proper material distribution requires direct WPB supervision in all factories and shops. Negotiations are under way to have the existing force of Army and Navy plant inspectors supervise the filing of PD-25-A applications at the various war factories. Direct supervision is necessary.

See page 104A for late priority news.

There are plans afoot to limit each producers rate of manufacture, so that plants which are able to get ahead of schedule will not be permitted to distort the balance of material supply. For example, a company might be given an AA-1 rating for 1000 units of a given material without the privilege of making an interim application during the quarter, when it had used all of the material. It was pointed out that apparent material shortages could be created by allowing the over-production of any one item at the expense of another.

Washington •

• • • **On Aug. 6 WPB** acted to allow firms who have filed under PRP, but who have not yet received their allocation certificates, to obtain an additional 30 per cent of their indicated requirements. With the 40 per cent previous allowance they are now able to order 70 per cent of their third quarter requirements. Deliveries are, of course, to be deducted from quantities allowed when the PRP certificate is finally received.

Firms which have not received their certificates may apply or extend ratings on orders received so that they can obtain material required. The amendment applies to the current quarter, and the board also provided that Class I producers who have submitted PRP applications for the fourth quarter may order for delivery in

in all standard types and sizes

T-J DIE SINKING MILLING CUTTERS

are sturdy, hold a sharp edge and carry less breakage percentage. They meet even today's production requirements **with more work between grinds.** Write for Catalog No. 139 to 628 N. Mechanic St., Jackson, Michigan.

THE TOMKINS-JOHNSON CO.

October up to 40 per cent of their indicated requirements, and for delivery in October and November up to 70 per cent of such requirements, prior to receiving certificates.

Material delivered under the interim procedure must of course be deducted from amounts authorized on the certificate when it is received. It is anticipated that fourth quarter PRP certificates issued as a result of applications submitted before Aug. 10 will be mailed back to the applicants soon after the middle of September after necessary calculations and over-all requirements determinations have been made.

This amendment, No. 3 to P. R. 11, is designed to aid companies who find it necessary to place orders for October and November deliveries before their fourth quarter certificates are received.

Silver is added to the list of metals which must be considered in determining whether or not a company is a Class I producer, and ferro-alloying agents, oxides and other compounds of non-ferrous metals previously contained in the metals list are removed.

•

Typewriter Production to Stop

• • • **Typewriter** manufacture will stop completely on Oct. 31, except for a relatively small number to be produced for Government agencies by the Woodstock Co., under the terms of a WPB order issued on Aug. 4. Portable typewriter production was halted on July 31, in accordance with directions to the industry confirmed by this order.

The Amended Order, L-54-a permits the major companies to build up to 12¼ per cent of their non-portable billings in 1941 during the period between July 1 and Oct. 31. This represents slightly more than a 60 per cent cut in the 1941 rate of production.

New typewriters remain under complete allocation control. Export parts can be made on a quota proportional to production of new machines up to Oct. 31. The Woodstock Co. will build 22,701 office type machines during the period ending June 30, 1944.

•

Canada Revises Rules For Iron and Steel Orders

Toronto

• • • **New regulations** in connection with the placing of orders for iron and steel in Canada, have been announced by F. B. Kilbourn, Steel Controller. The communication from the Steel Controller to purchasers of steel in Canada follows:

"The adoption in Canada and the United States of the new standard 'End Use Code' is expected to benefit the war program of the United Nations. In order to streamline Canadian methods and make them fit into the pattern on both sides of the border, it is necessary that the entire Canadian steel industry provide a uniform picture of the disposal of its products. Please take notice, therefore, that after July 31, 1942, every purchase order for any iron or steel products must be accompanied by a duplicate copy of Form SC-1000, properly completed by the customer. This applies to all orders accepted by any producer of the items listed in the revised official schedule of iron and steel products. It is necessary for customers of wholesalers to fill in the

FOR TOOLS THAT MUST BE TOUGH!

USE JESSOP "RT" WATER-HARDENING TOOL STEEL

Jessop RT is a water-hardening tool steel of extreme toughness. It hardens to about C-62 Rockwell and when drawn back to about C-59 Rockwell, is unusually strong and tough. A tensile test, on properly treated RT, will show a breaking strength of 323,000 pounds per sq. in., with elongation in 2" of 4.5%.

In addition to this extreme toughness, you get all the hardness and wear resistance necessary, without danger of breakage.

There are a vast number of tools and parts—especially those classified as "battering tools"—that will perform with greater efficiency when made of Jessop RT Water-Hardening Tool Steel. Write for further information.

JESSOP STEEL COMPANY
WASHINGTON, PENNA., U. S. A.

JESSOP STEELS FOR AMERICA AND HER ALLIES

CARBON • HIGH SPEED • SPECIAL ALLOY • STAINLESS • COMPOSITE STEELS

form when ordering any quantity of stainless steel, tool steel (including high speed steel); other grades of alloy steel when quantity ordered is 2000 pounds or more, other grades of carbon steel when quantity ordered is 8000 pounds or more, of any item in the official schedule of iron and steel products.

"Before August 15, 1942, it will also be necessary to have customers complete a form covering their outstanding orders issued prior to August 1, and calling for shipment after July 31. In the case of these unfilled orders, it will be proper for any customer to certify any number of orders on one duplicate copy of form SC-1000 provided that all of the orders covered by one form are for the same product and the same identical purpose of use."

•

Gang Lawn Mowers

• • • **The manufacture** of gang mowers for the Army, Navy, Maritime Commission and Lend-Lease may be resumed at the second quarter rate of production under Amendment No. 2 to Order L-67, issued Aug. 1 by WPB.

•

Heat Exchangers Now Under Complete Allocation

• • • **Heat exchangers,** urgently needed in war industries and by the Army, Navy and Maritime Commission, were placed under a system of complete allocations Aug. 5, by Order L-172 which prohibits the placing or acceptance of orders for heat exchangers covered by the regulations unless specific authorization is granted by the director general on Form PD-615A. Application for authorization to place orders must be made on Form PD-615.

Manufacturers with whom orders authorized by the director general are placed must accept such orders, unless the person seeking to place the order is unwilling or unable to meet regularly established prices and terms of sale or payment.

In addition, regardless of any prior commitment or preference rating, manufacturers are prohibited, beginning 15 days after the date of the order's issuance, from delivering any heat exchangers unless authorized by the director general under a set procedure involving the filing of reports by manufacturers showing heat exchangers available for distribution and orders on hand.

Heat exchangers listed in manufacturers' reports as scheduled for delivery on or before Aug. 31 may be delivered without specific authorization after WPB has received the reports. However, the director general may revoke such automatic authorization at any time.

In order to obtain permission to make delivery of heat exchangers not scheduled for delivery before Aug. 31, manufacturers must file application on Form PD-615B on or before the 25th day of each month.

During the next 30 days, the Army, Navy and Maritime Commission and War Shipping Administration will be exempt from the terms of the order.

•

PRP Not Mandatory for Firms Outside Continental U. S.

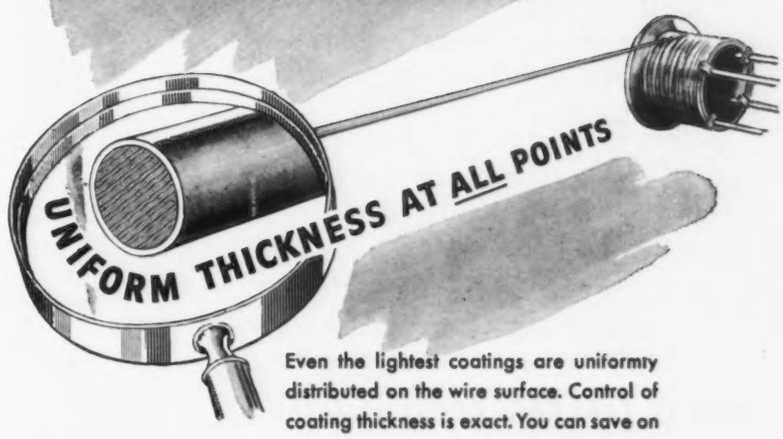
• • • **Mandatory** use of the Production Requirements Plan by companies located outside continental United States which would otherwise be required to apply under PRP for the fourth quarter of 1942

ECONOMIZE ON ZINC

with

MEAKER PROCESS

for Electro-Galvanizing Wire



Even the lightest coatings are uniformly distributed on the wire surface. Control of coating thickness is exact. You can save on zinc, produce more perfect coatings, make more profit with Meaker Process for Electro-Galvanizing Wire.

"A proven success by every test"

WE INVITE YOUR INQUIRY

The MEAKER Company

1635 South 55th Avenue, Chicago

was rescinded by Amendment No. 1 to Exemption No. 1 of Priorities Regulation No. 11, Aug. 5.

•

Nitrocellulose Controlled

• • • **Control over** the distribution of soluble nitrocellulose was ordered Aug. 6. The order, M-196, gives the director general power to direct the amounts of each type that may be produced.

Deliveries of more than 1000 lb. a month of soluble nitrocellulose may be made only by special authorization of the director general.

Deliveries of more than 232 lb. and less than 1000 may be made without allocation, but with a certificate to the supplier that the soluble nitrocellulose is to be used to fill war orders, plus an amount not in excess of 50 per cent of the average monthly consumption of the consumer in 1941.

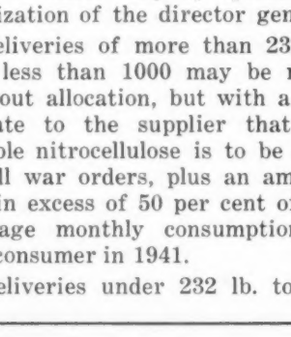
Deliveries under 232 lb. to one person in a month are not restricted.

Form PD-609 is provided for requests for allocation of soluble nitrocellulose and PD-610 for monthly reports by producers and distributors.

Deliveries of smokeless powder scrap by the Army or Navy do not require either authorization or a purchaser's certificate.

No deliveries of undissolved film scrap may be made without express authorization of the director general.

HOW TO TURN 90 MINUTES INTO AN HOUR!

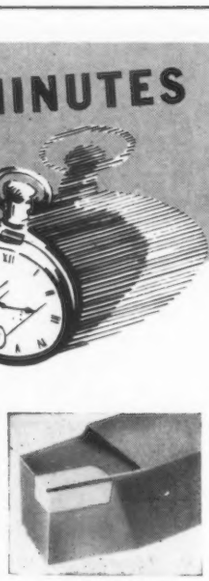


PUT KENNAMETAL* TO WORK IN YOUR *Machine Shop*

KENNAMETAL, because of its strength, hardness and crater-resistance, reduces machining time on hardened steels in three ways. First, it can be used at a wider range of speeds than other carbides. Second, it can take deeper cuts. And third, it removes more metal between grinds.

All of these advantages mean that KENNAMETAL allows every machine to do as much as 50% more work in any given time. Production is increased, costs are lowered . . . and 90 minutes' work is done in every hour of operation.

If one of your jobs is to increase production of steel parts, get the details about KENNAMETAL. Write for the Vest Pocket Manual.



STYLE 11 TOOL

STYLE 21 TOOL

STYLE 3 TOOL

HOW TO TAKE CARE OF KENNAMETAL

Apply Coolant in Continuous Flow

If coolant is used, it should be applied in a steady flow, forced against the tool with sufficient pressure to give complete immersion at all times.

KENNAMETAL THE All American CARBIDE

*INVENTED & MANUFACTURED IN U.S.A.

McKENNA METALS Co.

144 LLOYD AVE., LATROBE, PENNA.

Foreign Sales: U. S. STEEL EXPORT CO., 30 Church St., New York (Exclusive of Canada and Great Britain)

WPB Asks 73 Industries For Voluminous Statistics

Washington

• • • **Form PD-732** sent out by the WPB Statistics Division monthly to a selected list of industries, is tabulated by the Bureau of the Census and requires manufacturers to furnish information regarding the classes of products shipped, the total value thereof, prime contracts shipped to Army, Navy or Maritime Commission, other rated orders, and non-rated orders. The form also requests data with respect to shipments, unfilled orders and man-hours on war and civilian products, scheduled peak operations, plant utilization, including the number and type of machine tools and other metal working machines. Total payrolls, machine hours and wage earners, including information on the pattern of work shifts is to be shown.

The following 73 industries have been asked to fill out Form PD-732 to furnish information on conversion, etc., during the current month:

•

Turbo-Blowers Allocated

Washington

• • • **Under Order L-163,** issued by WPB Aug. 7, no one may place or accept orders for turbo-blowers covered by the regulations unless specific authorization is granted on Form PD-616A. Application for authorization to place orders must be made on Form 616. Turbo-blowers listed in these statements for delivery on or before Aug. 31 may be delivered without specific authorization upon receipt of the statements by WPB. However, the director general may revoke such au-

tomatic authorization or change delivery schedules at any time. The order, although in the "L" series, does not limit production directly but provides for allocation of finished products.

In order to obtain clearance of deliveries of turbo-blowers not scheduled for delivery before Aug. 31, manufacturers or dealers must file applications on Form PD-616B on or before the 25th day of each month. Unless the director general orders otherwise, delivery schedules set forth in these monthly reports may be carried out without specific authorization.

Manufacturers and dealers with whom authorized orders are placed must accept such orders, unless the person seeking to place the order is unwilling or unable to meet regularly established prices and terms of sale or payment. Regardless of any prior commitment or preference rating, manufacturers and dealers are prohibited, beginning 15 days after Aug. 7, from delivering any turbo-blowers unless authorized.

None of the restrictions in the order apply to turbo-blowers to be delivered to the Navy or Maritime Commission for shipboard use, or to any privately-owned shipyard or plant for installation in ships built or repaired for the Navy or Maritime Commission.

Manufacturers and dealers must file a statement within 15 days showing the orders for turbo-blowers they had on hand as of Aug. 7, a description of the equipment, names of the proposed purchasers, and the preference rating certificate number and the rating assigned to each order.

•

Farm Equipment Repair Parts

• • • **Producers of attachments** and repair parts for farm equipment were given permission by WPB on Aug. 6 to distribute materials between groups established under Order L-26, as amended, provided they do not exceed their over-all production quotas. However, over-all quotas must be maintained.

•

Automotive Replacement Parts

• • • **Producers of parts** for motor cars, trucks, trailers, buses and off-the-highway motor vehicles are now permitted to schedule production of replacement parts without regard to purchase orders of contracts placed with them for other material on ratings lower than A-1-a. The move, designed to expedite production of replacement parts to keep the country's motorized equipment in good running order, was issued last week as Amendment No. 1 to Order L-158.

•

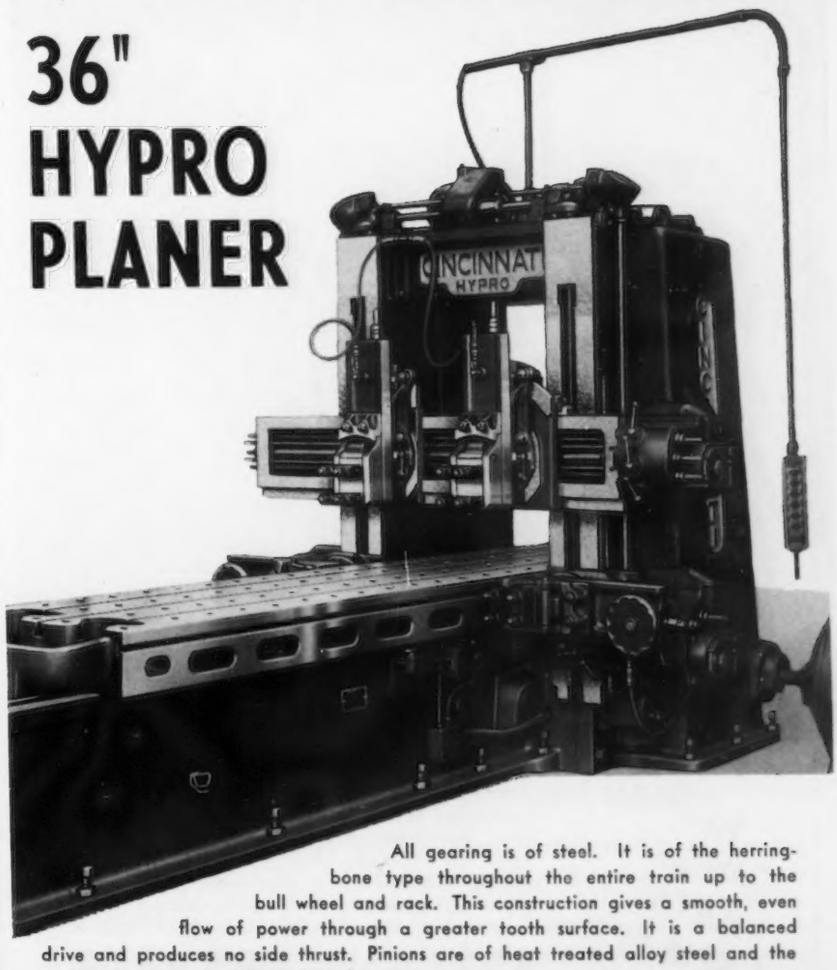
Copper Order Amended

• • • **Copper Order M-9-b** was amended Aug. 7 to require proof from foundries and ingot makers that they are entitled to receive delivery of refined copper, alloy ingots or copper scrap.

Foundries and ingot makers authorized to receive deliveries of refined copper must surrender their allocation certificates to dealers at the time orders are placed. If an order is placed with a refiner, the refiner must endorse the certificate specifying the amount of refined copper he will deliver.

Cincinnati

36" HYPRO PLANER



All gearing is of steel. It is of the herring-bone type throughout the entire train up to the bull wheel and rack. This construction gives a smooth, even flow of power through a greater tooth surface. It is a balanced drive and produces no side thrust. Pinions are of heat treated alloy steel and the rack and gears are of forged steel.

PLANERS · PLANER MILLERS · BORING MILLS

THE CINCINNATI PLANER CO.

CINCINNATI, OHIO

If the customer is purchasing copper alloy ingot, copper scrap or copper alloy scrap, he must attach a certification to his purchase order giving the number of his allocation certificate.

•

Metal Office Furniture

Washington

• • • **Manufacturers of metal** office furniture were instructed by WPB on Aug. 5 to work on no furniture order—old or new, military or civilian—unless specific authorization is obtained from WPB. The order, L-13-a revised, is designed to insure that the production of office furniture is held to minimum essential needs.

•

Moly is Further Restricted

• • • **Molybdenum may** be melted only after approval of melting schedules as provided in order M-21-a or by specific authorization, the Director General for Operations ruled Aug. 8, in a revision of order M-110.

The action places molybdenum under the same restrictions as vanadium, since both are used almost entirely in the manufacture of alloy steel and largely by the same users. The order is extended until revoked.

•

Iron and Steel Allocated For Oil Burner Conversion

• • • **A total of** 11,009 tons of iron and steel necessary for the conversion of the country's oil burner furnaces to coal furnaces was allocated on Monday by WPB to assure manufacturers of grates and equipment for installation before winter.

A preference rating of AA-3, the top civilian goods rating, has been assigned to the delivery of such materials. In order to get iron and steel for grates, a manufacturer should file Form PD-25F or PD-1A, depending upon whether he is operating under PRP.

•

Laboratories Under PRP

• • • **Research laboratories** which put into process $5000 worth of metals a quarter or more are required to file under PRP, it was pointed out on Tuesday by Amory Houghton, WPB Director General for Operations.

•

WPB Clarifies Use Of Urgency Standings

• • • **WPB on Monday** told machine tool producers that an urgency standing should not be used with the PD-1A certificate because the holder of such certificate cannot, by definition, be a service purchaser. If a person seeking to buy a machine tool is not a service purchaser, the tool must come out of the quota assigned to foreign and other purchasers and the sequence of its delivery will be determined solely by its required delivery date and its preference rating.

General Preference Order E-1-b defines as service purchasers those whose preference ratings certificates or whose endorsed purchase orders show that the preference rating was assigned

Bending MADE SIMPLE

for RINGS ARCS and SPIRALS

Buffalo Bending Rolls bring speed, skill and accuracy even to unskilled operators. With a minimum of manual operations, these husky production machines turn out circular forms *on schedule*. Buffalo Bending Rolls are heavy-duty built, simple to control and equal to the most exacting requirements of today's war production.

BUFFALO FORGE CO.
492 Broadway Buffalo, N. Y.
Canadian Blower & Forge Co., Ltd., Kitchener, Ont.

Buffalo Bending Rolls

by an original Preference Rating Certificate PD-3, PD-3A or PD-4 or by Preference Rating Order P-19-h.

•

Directives Ease Warehouse Shortages

• • • **Small steel** consumers, depending primarily on warehouse stocks for their supplies are facing a serious shortage as these stocks continue to dwindle. As a result, WPB has stepped in to issue directives on shapes which the warehouses had on orders with ratings down to A 1-j. Mills have also received directives so as to assure some warehouse stocks of NE and alloy steels.

•

AAA Ratings Issued for Breakdowns in Mining

• • • **On Monday** of this week WPB assigned AAA ratings to speed repairs of breakdowns in the mining industry. The action was taken as Amendment No. 3 to amended order P-56. A-1-a and A-1-c ratings were granted for repair parts for machinery and equipment on Schedule A of the order which includes most mining machinery. Ratings of A-8 and A-10 are assigned for all other maintenance and operating supplies.

•

Furniture Iron and Steel

• • • **Production of** wood upholstered furniture containing any iron or steel other than joining hardware was prohibited by WPB by Order L-135 issued last Saturday. The order stops delivery of steel wire or flat steel to be used in the production of steel upholstery springs. Use of steel by the wood upholstered furniture industry amounted to 30,000 tons in 1941.

The types of furniture covered by the order are products containing less than 5 per cent of metal other than steel springs and joining hardware.

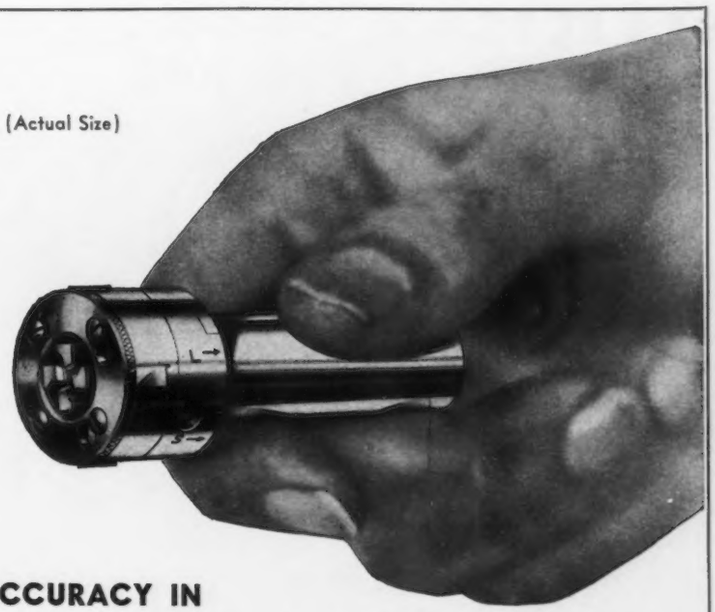
•

Industrial Cars

• • • **Railroad type** industrial car manufacturers are prohibited from making or delivering any cars except upon specific authorization by Order L-97-b, issued Saturday. The order also limits repair, rebuilding and converting of such cars for sale but not to repairs by or for an owner where there is no intention to sell. Producers may schedule production and make deliveries only in accordance with special directions issued from time to time by WPB.

The approved schedules must be maintained without regard to any preference ratings, already or hereafter assigned prior commitments or purchase orders. If it becomes impossible for any producer to maintain production and delivery in accordance with an approved schedule, he must notify the WPB Director General for Operations immediately.

(Actual Size)



ACCURACY IN SMALL DIAMETER, FINE PITCH THREADS?

SPECIFY . . . 3/16" STYLE EJ5 GEOMETRIC SOLID ADJUSTABLE DIE HEAD!

Will cut from 1/16" to 3/16" in diameter, in pitches as fine as 100 per inch. (Separate Chasers required for each diameter, pitch and thread form).

Chasers have a projection to facilitate cutting close to a shoulder.

REMOVABLE . . . ADJUSTABLE CHASERS

. . . . . Easily adjusted to cut within close tolerances.

. . . . . Removable from die head and easily resharpened.

Over 45 years devoted to production of Thread Cutting Tools . . . . We offer you Long Threading Life and Continued Accuracy in this Die Head.

Ask for our EJ5 Booklet.

THE GEOMETRIC TOOL COMPANY
New Haven, Conn.

Swedish Sponge Iron Plant Used Magnetite Concentrates

Wheeling, W. Va.

• • • **Regular iron ore** was not used by the Hoeganaes plant in its sponge iron operations, said Feodore F. Foss, Wheeling Steel Corp., in a recent comment on the sponge production of the Swedish company. A very special magnetic concentrate (71 per cent iron, 0.001 per cent sulphur and 0.01 per cent phosphorus) was used, he said.

Recounting the experience of the Hoeganaes plant, Mr. Foss said, "During or about 1908, Swedish engineer S. E. Sieurin worked for the Hoeganaes Co. on the briquetting problem of iron concentrates from Gellivare magnetite iron ore. After having failed in following the regular pattern of ore concentrates calcining in a tunnel furnace, he decided to imitate sponge iron making as practiced in Shansi province of China.

"The properties of the Hoeganaes Co. contain a deposit of medium quality coal which is easy and cheap to mine, and a seam of very good refractory clay. Hoeganaes, being on the sea, has very favorable shipping rates. With concentrates from northern Sweden, Mr. Sieurin made sponge iron giving the following analysis:

Iron	96-96.5%
Sulphur	.015 (Usually .013)
Phosphorus	.013 (Usually .01)
Gang (mostly silica)	1.5 to 2.0
Oxygen	1.5 to 2.0
Carbon	About .03
Manganese	Trace
Vanadium	About .15

"At the time of my visit to Hoeganaes in 1914, its sponge was delivered to steel makers in Sheffield, England, at a price somewhat higher than high grade pig iron. Production of sponge iron reported in official Swedish statistics for the period of 1918 to 1936 was as follows (in metric tons):

1918	6,100	1928	6,014
1919	1,332	1929	10,253
1920	4,263	1930	no data
1921	no data	1931	no data
1922	no data	1932	8,721
1923	2,193	1933	1,776
1924	589	1934	7,418
1925	3,610	1935	8,316
1926	2,610	1936	11,060
1927	6,598		

"Since 1929, Hoeganaes sponge iron had been offered on the American market in rather limited quantities and was used in electrical furnaces with good technical results.

"It is clear that the limited success achieved by Hoeganaes sponge iron—the only sponge on competitive international market—was due to the unique combination of natural conditions and comparatively low hourly labor rates. With all favorable conditions for its production, however, Hoeganaes sponge iron has been profitably used only as raw material for high grade steel making where the purity of a sponge cake is at a premium."

EFFICIENT DOORS THAT

Repel Fire

ALSO BLOCK SABOTEURS

AND RESIST WEAR

Kinnear Rolling Doors give you the protection you need at doorways to safeguard vital war production *plus* the door efficiency you need to help keep production rolling at top speed. Their famous interlocking-slat construction (Kinnear *originated* it) provides strong, durable, *lasting* protection against fire, riot, theft, sabotage, wind, weather and accidental damage. And they aid production by saving space, time and labor — they open upward, smoothly and easily; they coil compactly out of the way right above the doorway; they permit full use of all floor, wall and ceiling space at all times; and their operation is never obstructed by nearby objects. Give your plant — and your production—these proved advantages. Install Kinnear Rolling Doors now. Any size, motor or manual control.

You'll also find valuable extra protection in Kinnear Rolling Fire Doors and Window Shutters. They're approved and labeled by the Underwriter's Laboratories! Write for complete data. The Kinnear Manufacturing Company, 1760-80 Fields Avenue, Columbus, Ohio.

SAVING WAYS IN DOORWAYS KINNEAR ROLLING DOORS

Army-Navy Officials Laud Workers' Effort

• • • **Pratt & Whitney** division, Niles Bement Pond Co., West Hartford, Conn.; Scovill Mfg. Co., Waterbury, Conn., and Bullard Co., Bridgeport, Conn., have been awarded the joint Army-Navy "E" by the War Department. Outstanding performance on war work in the production of machine tools was the basis of the recognition.

Wyckoff Drawn Steel Co., Pittsburgh, has also been awarded the new Army-Navy "E" and according to J. T. Somers the flag will be flown from both the Ambridge, Pa., and Chicago plants of the company.

Five employees of Crocker-Wheeler Electric Mfg. Co., Ampere, N. J., were awarded silver "Vie for Victory" pins last week for suggestions and ideas presented in a Labor-Management Committee's contest to accelerate war production. The celebration was attended by ranking Navy officials as well as company executives.

Doehler Die Casting Co., has been awarded the Army-Navy production award with star for especially meritorious production of war materials. Admiral H. A. Wiley, on behalf of the Secretary of the Navy, congratulated all the employees for their outstanding performance.

Employees of Lodge & Shipley Machine Tool Co., Cincinnati, were congratulated for their war work effort recently by Rear Admiral F. C. Sherman, when he made a tour of the plant which holds a Navy "E." Admiral Sherman, commander of the aircraft carrier Lexington, lost in the Coral Sea battle, said that workers on the production line are as vital as those on the firing line.

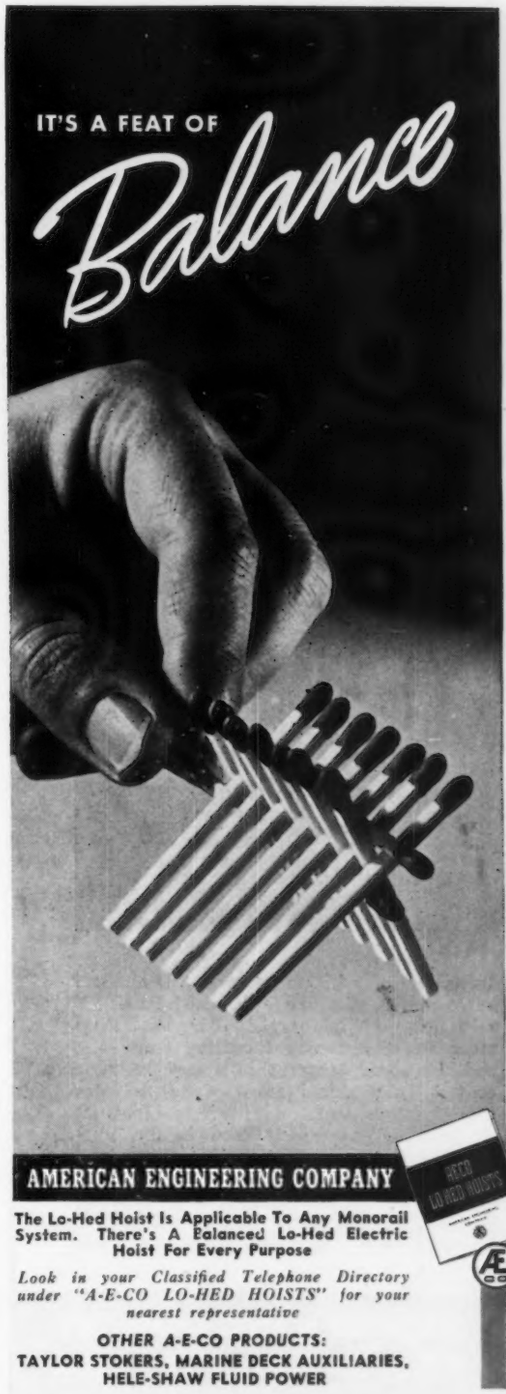
The "Minute Man" flag and certificate of award were presented to Edgar W. Longacre, vice-president, as recognition of the fact that 100 per cent of the National Radiator Co. employees are pledging payroll deductions for the purchase of war bonds.

The Greenfield Tap & Die Corp., Greenfield, Mass., has received notification, from the under secretary of war, of the joint Army-Navy production award in recognition of its efforts in the war effort. Appropriate ceremonies in connection with the presentation of the Army-Navy pennant will be held outside of the plant in Greenfield, on Aug. 19.

Five Pennsylvania and New Jersey plants of the Westinghouse Electric & Mfg. Co. are to receive the new Army-Navy Award pennant "for high achievement in the production of war equipment."

The Army and Navy have conferred on the Autocar Co., Ardmore, Pa., their "E" pennant "for high achievement in the production of war equipment." In addition to the banner which can be displayed at the Autocar plant, every employee will receive a silver lapel button carrying the insignia of the award.

The joint Army-Navy production award has been given to the General Bronze Corp., Long Island City, N. Y. The company had previously been awarded the Navy "E" pennant.



BALANCE
was only the beginning of the story of this hoist

When one of our representatives saw the picture of this ad he said, "Yes, this illustrates our big point, the balanced arrangement of the motor and drum about the beam. But there's more to the Lo-Hed story in these times than balance. Listen . . .

"When I see a customer, I don't have to sell him on balanced design, all-spur gear drive, heavy duty hoist motor and all other features. The customer takes me by the arm out into the plant, points to a Lo-Hed and says, 'See that Lo-Hed? Been running every day for 5 years . . . on three shifts now . . . not a cent for repairs yet.' Then the customer sells *me* on a Lo-Hed."

We make no claim that a Lo-Hed will run for 5 years or 10 years without a cent for upkeep. But it is true that Lo-Heds are precision built to last for years. It is true that they have an exceptional record for low maintenance. And it is true that they sell themselves to customers. If you need an electric hoist now, buy one that will be on the job years from now. Buy a Lo-Hed. Send for the 28-page Lo-Hed catalog today.

AMERICAN ENGINEERING COMPANY

The Lo-Hed Hoist Is Applicable To Any Monorail System. There's A Balanced Lo-Hed Electric Hoist For Every Purpose

Look in your Classified Telephone Directory under "A-E-CO LO-HED HOISTS" for your nearest representative

OTHER A-E-CO PRODUCTS:
TAYLOR STOKERS, MARINE DECK AUXILIARIES, HELE-SHAW FLUID POWER

AMERICAN ENGINEERING COMPANY
2410 Aramingo Avenue, Philadelphia, Pa.

☐ Please send me your complete catalog of LO-HED HOISTS

☐ Ask your representative to get in touch with me promptly

Name .....

Company .....

Street Address .....

City ..... State .....
(Please Print Plainly)

Farm Equipment Makers Given New Maximum Price Formula

• • • **Makers of farm** tractors and other farm equipment have been given a formula for calculating maximum prices of models in which there have been changes in design or construction since March 31.

The formula is to be used, too, in revising maximum prices on future models as structural changes warrant. It permits the adjustment of differences in manufacturing costs attributable to changes in design, materials or manufacturing methods, and at the same time simplifies price revision procedure for the manufacturer.

It permits quick adjustment of prices as scarcity of traditional materials for peace-time goods forces a shift to substitutes, or as inventions or improvements in farm equipment bring changes in design. The formula applied to the present change over from rubber tires to steel is expected to bring about reductions in the prices of most tractors and farm implements according to OPA.

The formula is contained in Order No. 51 under § 1499.3 (b) of the General Maximum Price Regulation, and becomes effective Aug. 7, 1942, and is:

1. The revised maximum price to purchasers receiving the lowest net price or highest discount shall be calculated by adding to or subtracting from the original maximum price the net increase or decrease in factory cost attributable to the change in design or equipment.

2. The revised maximum prices to other classes of purchasers, if any, shall be calculated by applying to the above revised maximum net price the same percentage price differentials as were in effect March 31, 1942, for such purchasers. Likewise, the revised maximum list price, if any, shall be calculated by applying to the revised maximum price of the foregoing paragraph the same percentage differential as was in effect on March 31, 1942, between the lowest net price and the list price.

The Price Administrator pointed out that the net increase or decrease in factory cost attributable to the change in design or equipment shall be calculated by the use of:

1. Materials prices actually being paid, and not to exceed maximum prices established by the Office of Price Administration for such materials.

2. Direct labor cost based on labor rates in effect on March 31, 1942.

3. Factory overhead allocable to such direct labor cost charged at the actual average rate in effect during the quarter ended March 31, 1942, or at the standard rate consistently used in the company, whichever is the lower.

No charge for profit or for overhead, other than such factory overhead, shall be included in the net increase or decrease in factory cost attributable to the change.

Within ten days after a revised maximum price has been determined, a report of it must be filed with the Office of Price Administration for approval.

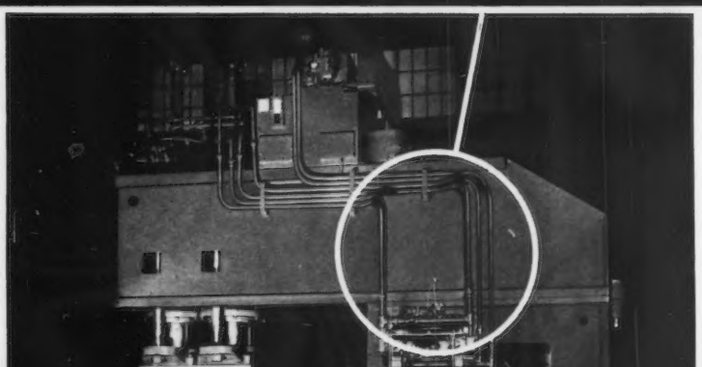
•

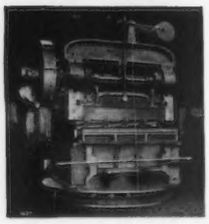
Tungsten Price Up in Canada

Toronto

• • • **Price of tungsten** in Canada has been raised from $20 to $24 per short ton unit. A short ton unit is one per cent of a short ton, or 20 pounds. The increase, authorized by G. C. Bateman, Metals Controller, applies to concentrates averaging approximately 65 per cent tungsten trioxide (WO_3), and containing harmful impurities not in excess of the maximum per-

"ICE WATER In Its VEINS?"





BEATTY HEAVY PLATE SHEARS

Incorporating the latest type pump and valve design, this newly designed BEATTY Hydraulic Flanging and Forming Press eliminates the need for cooling coils . . . and the acute danger that a leak in these cooling coils would allow water to enter the oil supply tank. Available in capacities up to 750-Ton; widely used in the shipbuilding, tank, aircraft, railroad car and other vital war industries. If your production calls for punching, coping, shearing, flanging, forming or the like, let a BEATTY Engineer help you speed your war work.

BEATTY MACHINE & MFG. COMPANY HAMMOND, INDIANA

mitted for commercial transactions.

It is hoped that the increase in price will stimulate greater production from Canadian mines, Mr. Bateman said. The new order points out that the Department of Munitions and Supply is not limited by the price ceiling in purchases made to increase government stock piles.

Canadian price for tungsten last year was $17.50 per unit, and was raised to $20 per unit a few months ago and the new price, which went into effect this week, makes it $6.50 per unit higher than the 1941 price.

•

Ferromanganese Amendment

• • • **Amendment No. 2** of GMPR 138 issued Aug. 6, and effective Aug. 11, covering standard ferromanganese, changes section 3, paragraph (c), to read "Any person, herein referred to as the converter, who after April 28, 1942, enters into a contract of the same nature as the contracts described in paragraph (a) of this section, shall submit a certified copy of such contract to the OPA, Washington, D. C. On and after May 1, 1942, no such contract shall be of any effect until the OPA has approved the fee and other charges to be made thereunder by the converter for the conversion of manganese ore into standard ferromanganese."

•

Price Set on Silver Import

Washington

• • • **In order to** check an inflationary rise in the price at which silver bullion is imported and to remove the incentive for speculative withholding in anticipation of higher prices the OPA last week set maximum prices at which silver bullion may be imported into the United States.

Domestic silver and domestic resales of imported silver have been subjected to the General Maximum Price Regulation since that regulation went into effect on May 11.

Beginning Aug. 10, no person may import standard commercial bar silver at a price higher than 35⅜ cents per ounce, regardless of existing contracts. This ceiling price is established in Maximum Price Regulation No. 198, Imports of Silver Bullion.

At the same time imported silver bullion has been excluded from paragraph 13 of supplementary regulations No. 4 to GMPR which lists imported commodities not affected by GMPR if the domestic importer deals directly with the seller in a foreign country.

•

Coal Price Adjusted For Beehive Coke Ovens

• • • **Because of the** necessity of assuring a steady supply of bituminous coal to the mover than 4500 beehive coke ovens now operating in western Pennsylvania, as well as the fact that present maximum prices for truck shipments to beehive ovens are below costs of production of many of the deep mines in this area, the Office of Price Administration has adjusted the maximum price for these mines to conform to the price ceiling on bituminous for shipments by truck or wagon to other users.

This action was contained in

Ships on the Production Line

ACP Products save time and step-up efficiency in Navy and private shipyards

Just as ACP DEOXIDINE helped make the mass production of automobiles possible . . . and as ACP RODINE boosted the efficiency and volume of steel production . . . so, today, these and other ACP Products are helping build the vital bridge of ships.

RODINE in pickling baths, saves both steel and acid and prevents pitting and burning of plates. It minimizes acid embrittlement, making plates easier to machine, bend and drill. DEOXIDINE is the time-tested acid cleaner. On aluminum ventilating ducts and superstructure sections, it removes oil, eradicates corrosion and neutralizes corrosion-producers. LITHOFORM chemically coats galvanized surfaces to prevent the characteristic blistering and peeling of paint.

All three have long served their apprenticeship with the growth of American Industry.

•

Among the other ACP Products are: FLOSOL, an exceptional soldering flux for steel, brass, copper, tin, terne plate, zinc and galvanized iron; KEMICK, a chemical paint that holds to and protects metal surfaces even when heated to redness; CUPRODINE copper coats steel by simple immersion.

These and other ACP Products are available to you in speeding production of the vital bridge of ships. The experience of the ACP laboratories in metal treating and finishing processes is at your service.

AMERICAN CHEMICAL PAINT CO.

MAIN OFFICE AND WORKS
AMBLER . . . PENNA

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CHEMICALS ACP PROCESSES

DETROIT, MICH., 6335 Palmer Ave., E.
CANADIAN BRANCH
WALKERVILLE . . . ONT

PERFORATED METALS

INDUSTRIAL
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ANY METAL ANY PERFORATION

The Harrington & King PERFORATING CO.

5657 FILLMORE STREET—CHICAGO, ILL.
New York Office, 114 Liberty Street

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S.A.E. HY-TEN N. E.
STEELS

We Solicit Your Inquiries

Even though warehouse stocks today are not as plentiful as you and we would like there are still a substantial number of sizes in a variety of analyses available for immediate shipment. We will do everything within our power to help you make the guns and tools and ships and planes and tanks which will win the war.

WHEELOCK, LOVEJOY & CO., INC.
Main Offices 126 Sidney Street, Cambridge, Mass.

Cleveland, Chicago, Newark, Detroit, Buffalo, Cincinnati

Amendment No. 14 to Maximum Price Regulation No. 120 and becomes effective August 14, 1942.

•

Lake Coal Price Adjusted

• • • **Adjustment of the** maximum prices for run-of-mine and slack coal shipped by the Great Lakes from Western Pennsylvania, West Virginia and Ohio (Districts 2, 3, 4 and 6) to conform with the ceilings previously established for all-rail shipments of these coals was announced this week.

Establishment of maximum prices for run-of-mine and slack coal—a bituminous coal used mainly for industrial purposes—at the somewhat higher all-rail level is necessary, Mr. Henderson stated, because war conditions had led to tonnage which normally would move to markets served by Great Lakes vessels being diverted to markets served by railroads. The changes in the price schedule for the coal involved were contained in Amendment No. 15 to Maximum Price Regulation No. 120, (Bituminous Coal Delivered from Mine or Preparation Plant) effective August 15, 1942.

•

Lead Bullet Rod Price Set

• • • **Maximum Price** Regulation No. 199, covering lead bullet rod becomes effective August 13, 1942.

Lead bullet rod is the raw material from which is made the lead slug that forms the core of a rifle or machine-gun bullet.

The new regulation establishes a maximum price for lead bullet rod, f.o.b. producer's plant of 1.10c. per pound above the cost to the producer of the required metal ingredients.

Wheeling Still Negotiating

Wheeling, W. Va.

• • • **It was announced** here this week that negotiations between representatives of the Wheeling Steel Corp. and the United States Steel Workers of America (CIO) which began on July 28 are proceeding satisfactorily. Agreement has been reached whereby the 1941 agreement is extended and will remain in force for a sufficient period to permit both parties additional time in which to give consideraton to the fundamental questions of relationship which at this date are under consideration.

$2.03 Million Spent by Canada in Crown Companies

Ottawa

• • • **The government** of Canada has spend $203,248,880 on Crown companies organized for the war program, Finance Minister Ilsley reports. For the 23 companies organized, $54,520,051 has been invested in physical property with an additional $35,878,732 for loans and capital stock and $2,727,588 for administration. Working capital advances amounted to $109,906,701. One company, Trafalgar Shipbuilding Co. Ltd., Ottawa, was reported inactive. Advances to corporations operating under the Wartime Prices and Trades Board are: Commodity Prices Stabilization Corp., $15,653,337; Canadian Wool Board Ltd., $605,000; Wartime Salvalge Ltd., $300,000.

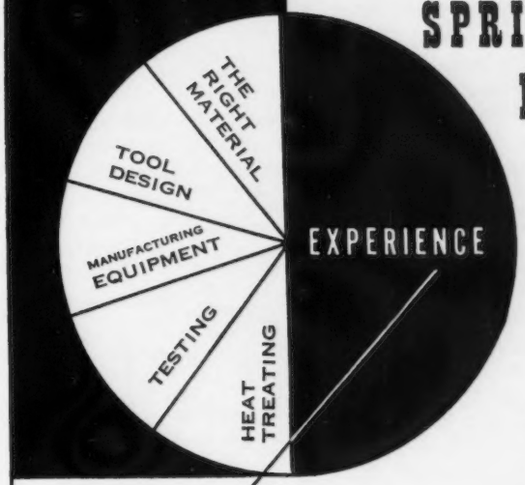
Total expenditure on other Crown companies have been: Small Arms, Ltd., Long Branch, $12,900,332; Toronto Shipbuilding Co., Ltd., Toronto, $6,625,000; Melbourne Merchandising, Ltd., Toronto, $14,515,352; Wartime Housing, Ltd., Toronto, $19,995,232; Plateau Co., Ltd., Toronto, $714,361; Cutting Tools, Ltd., Toronto, $202,808; Research Enterprises, Ltd., Toronto, $34,519,606; Polymer Corp., Ltd., Toronto, $35,000; Atlas Plant Extensions, Ltd., Welland, $11,006,458; Allied War Supplies Corp., Montreal, $1,162,848; Citadel Merchandising Corp., Ltd., Montreal, $11,078,942; Machinery Services, Ltd., Montreal, $394,220; National Railway Munitions, Ltd., Montreal, $4,482,848; Wartime Metals Corp., Montreal, $10,000; Federal Aircraft, Ltd., Montreal, $7,199,056; Park Steamship Co., Ltd., Montreal, $25,000; Wartime Merchant Shipping, Ltd., Montreal, $64,580,330; War Supplies, Ltd., Washington, D. C., $56,178.

Eastman Acts to Conserve Gondola and Flat Car Supply

• • • **The nation's supply** of gondola and flat cars for Army and industrial freight has become so acute that Joseph B. Eastman, transportation director, has appealed to all shippers to permit railroads to determine where practicable the type of car to supply on shippers' orders for loadings.

A week ago Mr. Eastman pointed out the heavy demands the coal industry had made on hopper cars and appealed to shippers to specify optional equipment if the lading could be handled in other types of cars. The situation in the supply of all open-top cars, however, has become critical, and shippers' advisory boards in various regions are urging that orders for open-top freight equipment be so placed that box cars, where available, may be substituted.

WHAT CONSTITUTES GOOD SPRINGMAKING PRACTICE?



Of all the factors that are involved in springmaking, by far the largest slice is contributed by *experience*. Before you make hard-and-fast specifications for springs, let Dunbar experience analyze your requirements. It has often paid off in the form of simplified design, savings, and better performance. *In our experience, nothing can take the place of experience.*

Dunbar Bros. Co.

DIVISION OF ASSOCIATED SPRING CORPORATION

BRISTOL, CONNECTICUT

"Quality Springs Since 1845"

HEAT-TREATED STEEL SHOT

We manufacture shot and grit for endurance

A shot or grit that will blast fast with a clean finish.

This is the only reason why so many operators are daily changing to our shot and grit, from Maine to California.

The unprecedented demand for our—

Heat-Treated Steel Shot and Heat-Treated Steel Grit

has enabled us to expand our production and maintain a quality that is more than satisfactory to our hundreds of customers all over the country.

•

HARRISON ABRASIVE CORPORATION

Manchester, New Hampshire

HEAT-TREATED STEEL GRIT

This Week's Priorities And Prices

Turbo-blower distribution is controlled under WPB order L-163, issued Aug. 7. (T-685)

Foundries must show right to deliveries of refined copper, alloy ingots or copper scrap, under Amendment 1 to amended order M-9-b, issued Aug. 7. (T-693)

Farm equipment price formula for calculating maximum prices of models in which there have been changes in design or construction since March 31 are given, Aug. 6. (OPA-T-31)

500 imports are placed by WPB on emergency shipping priorities list. (WPB-1637)

Firms outside the United States need not use PRP, according to Amendment 1 to Exemption 1 of Priorities Regulation 11, issued Aug. 5. (WPB-1657)

PRP extended interim procedure is provided for applicants who have not received their PRP certificates, under Amendment 3 to Priorities Regulation 11, issued Aug. 6. (WPB-1658)

Cans made of tinplate or terneplate may be used without limit, in small as well as large sizes, for packing tomato pulp or puree, under Amendment No. 1 to WPB order M-81. (T-680)

Iron and Steel scrap Revised Price Schedule No. 4 is changed to coordinate the schedule's operation with allocation of scrap by WPB. (OPA-T-39)

Railroad-type industrial cars for intraplant transportation are placed under strict control by WPB order L-97-b, issued Aug. 8. (T-694)

Molybdenum may be melted only after approval of melting schedules, or by specific authorization, under Amendment 1 to order M-110. (T-696)

Automotive parts output is expedited by Amendment No. 1 to Order L-158 which permits producers to schedule replacement parts regardless of other orders on their books bearing ratings lower than A-1-a. (WPB-1638)

Iron and steel can be fabricated into loose leaf book parts, etc., only up to 30 per cent of 1941 consumption, by Order L-188. (WPB-1641)

The War Shipping Administration is added to the Military Exemption List of Order M-126. (WPB-1642)

Typewriter output must stop on Oct. 31 under amended Order L-54-a. (WPB-1647)

Heat exchangers are placed under a system of complete allocation control by Order L-172. (T-675)

Metal office furniture control was tightened as WPB instructed manufacturers to work on absolutely no orders without specific WPB authorization. (T-676)

Licensees must obey all price orders according to Amendment No. 20 to GMPR, effective Aug. 8, requiring wholesalers or retailers selling commodities or services to adhere to price ceilings where they have been established. (OPA-433)

Silver bullion imports come under a price ceiling under Maximum Price Regulation No. 198, effective Aug. 10. (OPA-464)

Manganese conversion agreements are the subject of an amendment to Maximum Price Regulation No. 138, which establishes mechanics for handling OPA action on standard conversion agreements.

■ ■ ■

For copies of above announcements address Division of Information, WPB (or OPA), Washington, giving announcement number as shown in parentheses after each paragraph. (For example, **WPB-600** *means announcement* **600** *issued by the War Production Board.)*

o o o

Revisions to The Iron Age Priorities Guide

• • • The following data, together with all intermediate weekly revisions in THE IRON AGE, should be added to THE IRON AGE Priorities Guide published with the issue of June 4 to bring the Guide up to date.

Under "M Orders," page 6, add:

M-9-a...Amended order places all deliveries of copper under complete allocation. Allocation control to foundries is transferred from M-9-a to M-9-b. No new forms required (8-3-42).

M-9-b...Allocation control of copper to foundries transferred to M-9-b from M-9-a in amended order (8-3-42).

M-9-b amended...Amendment 1 (8-7-42) requires proof from foundries and ingot makers that they are entitled to receive delivery of refined copper, alloy ingots or copper scrap.

M-9-c...Amendment 5 (8-7-42) unfreezes copper costume jewelry stocks already fabricated.

M-43-a...Amended order permits production of 38 per cent tin content wiping solder to Sept. 1 for all purposes, and until Jan. 1 for utilities (8-4-42).

M-78...Amended order makes additions to prohibited and permitted uses (8-5-42)

M-81...Amendment 1 (8-6-42) permits unlimited use of tinplate or terneplate cans for packing tomato pulp or puree.

M-84...Amended to narrow uses for which agave fiber may be processed (8-5-42).

M-99...Channels old printing plates, etc., into war use (8-5-42).

M-110...Amendment 1 (8-8-42) provides molybdenum may be melted with specific authorization.

M-112...Amendment 1 (8-8-42) permits use of higher content of antimony in manufacture of battery grids.

M-119...Amendment No. 1 (8-5-42) permits manufacturers to use existing stocks of rubber closures which were manufactured by April 19.

M-126...Amendment No. 4 (8-3-42) adds War Shipping Administration to the list of Governmental agencies for which iron and steel products may be used; also revises the Military Exemption List.

Under "L Orders," page 19, add:

L-13-a...Amended order prohibits manufacturers from working on any order whatsoever without specific WPB authorization (8-5-42).

L-26 amended...Amendment 1 (8-6-42) authorizes producers of attachments and repair parts for farm equipment to distribute materials between groups already established under the order, provided they do not exceed over-all production quotas.

L-49...Amended order bans use of iron and steel in mattresses and studio couches as of Sept. 1 and Nov. 1 respectively (8-4-42).

L-54-a...Amended order requires typewriter production stopped on Oct. 31, except for one company producing small number for Government (8-4-42).

L-72...Amendment No. 2 (8-4-42) continues existing limitations in effect on safety razors and blades from Aug. 1 to Sept. 30.

L-97-b...Places production and delivery of railroad-type industrial cars under strict control (8-8-42).

L-104...Amendment 1 (8-8-42) permits manufacture of hairpins and bobpins to continue at same rate until Sept. 15.

L-126...Amendment 1 (8-7-42) to Schedule I corrects specifications for self-contained drinking water coolers.

L-135...Prohibits use of iron or steel, other than joining hardware, in production of wood upholstered furniture (8-8-42).

L-157...Amendment No. 1 (8-4-42) corrects tabular errors in original order.

L-158...Amendment No. 1 (8-1-42) permits automotive parts manufacturers to make replacement parts without regard to purchase orders or contracts placed with them bearing ratings lower than A-1-a.

L-163...Controls distribution of turbo-blowers (8-7-42).

L-172...Places heat exchangers under complete allocation control (8-5-42).

L-173...Cuts off further production of domestic space heaters calling for use of fuel oil or gas, except to fill certain Government orders (8-5-42).

L-188...Limits to 30 per cent of 1941 production the amount of iron or steel that may be fabricated or assembled into parts for blank books, binders, etc. (8-4-42).

Under "Priority Regulations," page 33, add:

Priorities Regulation 11...Amendment 1 to Exemption 1 (8-5-42) rescinds mandatory use of PRP by companies located outside continental United States.

Priorities Regulation 11...Amendment 3 (8-5-42) provides extended interim procedure for applicants under PRP who have not received certificates.

Steel Output In July 5% Above Year Ago

• • • **Steel production** in July totaled 7,148,824 net tons, the highest July output ever achieved by the steel industry, according to the American Iron & Steel Institute.

The tonnage produced in July represented a small increase over the June total of 7,022,155 tons, and was nearly 5 per cent above the July, 1941, total of 6,812,224 tons.

Total steel production in the first seven months of this year was 49,719,071 tons—5 per cent more than production in the corresponding period of 1941 and within 2 per cent of production in the whole year 1917, the peak for World War One.

During July, the tonnage of steel produced averaged 1,617,381 tons per week, as against 1,636,866 tons per week in June, and 1,541,227 tons per week in July a year ago.

Operations during July were at the rate of 94.5 per cent of the industry's capacity rated as of July 1, which represented a new peak in productive capacity of the industry. In June, the industry operated at 96.4 per cent of the lower capacity as of Jan. 1, of this year, while output in July, 1941, represented 93.3 per cent of the still smaller capacity available at that time.

YEAR 1941

Based on Reports by Companies which in 1941 made 98.5% of the Open Hearth, 100% of the Bessemer and 87.8% of the Electric Ingot and Steel for Castings Production

Period	Estimated Production—All Companies								Calculated weekly production, all companies (Net tons)	Number of weeks in month
	OPEN HEARTH		BESSEMER		ELECTRIC		TOTAL			
	Net tons	Percent of capacity	Net tons	Percent of capacity	Net tons	Percent of capacity	Net tons	Percent of capacity		
January	6,274,780	99.0	451,806	76.0	195,766	89.1	6,922,352	96.8	1,562,608	4.43
February	5,669,425	99.1	378,536	70.5	182,393	91.9	6,230,354	96.5	1,557,589	4.00
March	6,457,641	101.9	460,225	77.4	206,137	93.8	7,124,003	99.6	1,608,127	4.43
1st Quarter	*18,401,846*	*100.1*	*1,290,567*	*74.8*	*584,296*	*91.6*	*20,276,709*	*97.7*	*1,576,727*	*12.86*
April	6,137,613	100.0	395,056	68.6	221,510	104.1	6,754,179	97.6	1,574,401	4.29
May	6,362,245	100.4	444,079	74.7	238,241	108.4	7,044,565	98.5	1,590,195	4.43
June	6,098,171	99.4	458,848	79.7	235,732	110.8	6,792,751	98.1	1,583,392	4.29
2nd Quarter	*18,598,029*	*100.0*	*1,297,983*	*74.3*	*695,483*	*107.8*	*20,591,495*	*98.1*	*1,582,744*	*13.01*
1st 6 months	*36,999,875*	*100.0*	*2,588,550*	*74.6*	*1,279,779*	*99.7*	*40,868,204*	*97.9*	*1,579,753*	*25.87*
July	6,085,100	94.4	489,297	85.0	237,827	85.7	6,812,224	93.3	1,541,227	4.42
August	6,244,353	96.6	495,761	85.9	257,382	92.6	6,997,496	95.6	1,579,570	4.43
September	6,054,418	96.9	500,768	89.8	256,568	95.5	6,811,754	96.3	1,591,531	4.28
3rd Quarter	*18,383,871*	*96.0*	*1,485,826*	*86.9*	*751,777*	*91.2*	*20,621,474*	*95.1*	*1,570,562*	*13.13*
9 months	*55,383,746*	*98.6*	*4,074,376*	*78.6*	*2,031,556*	*96.4*	*61,489,678*	*96.9*	*1,576,658*	*39.00*
October	6,423,329	99.4	533,060	92.4	279,679	100.6	7,236,068	98.9	1,633,424	4.43
November	6,194,679	99.0	488,822	87.5	277,384	103.0	6,960,885	98.2	1,622,584	4.29
December	6,387,865	99.0	481,813	83.7	280,637	101.2	7,150,315	97.9	1,617,718	4.42
4th Quarter	*19,005,873*	*99.1*	*1,503,695*	*87.8*	*837,700*	*101.6*	*21,347,268*	*98.3*	*1,624,602*	*13.14*
2nd 6 months	*37,389,744*	*97.5*	*2,989,521*	*87.3*	*1,589,477*	*96.4*	*41,968,742*	*96.7*	*1,597,592*	*26.27*
Total	74,389,619	98.8	5,578,071	80.9	2,869,256	97.9	82,836,946	97.3	1,588,741	52.14

Note—The percentages of capacity operated in the first 6 months are calculated on weekly capacities of 1,430,102 net tons open hearth, 134,187 net tons Bessemer and 49,603 net tons electric ingots and steel for castings, total 1,613,892 net tons; based on annual capacities as of Jan. 1, 1941, as follows: Open hearth 74,565,510 net tons, Bessemer 6,996,520 net tons, electric 2,586,320 net tons. Beginning July 1, 1941, the percentages of capacity operated are calculated on weekly capacities of 1,459,132 net tons open hearth, 130,292 net tons Bessemer and 62,761 net tons electric ingots and steel for castings, total 1,652,185 net tons; based on annual capacities as follows: Open hearth, 76,079,130 net tons, Bessemer 6,793,400 net tons, Electric 3,272,370 net tons.

YEAR 1942

Based on Reports by Companies which in 1941 made 98.5% of the Open Hearth, 100% of the Bessemer and 87.8% of the Electric Ingot and Steel for Castings Production

Period	Estimated Production—All Companies								Calculated weekly production, all companies (Net tons)	Number of weeks in month
	OPEN HEARTH		BESSEMER		ELECTRIC		TOTAL			
	Net tons	Percent of capacity	Net tons	Percent of capacity	Net tons	Percent of capacity	Net tons	Percent of capacity		
January	6,328,128	95.4	490,864	86.0	305,930	96.3	7,124,922	94.7	1,608,335	4.43
February	5,791,813	96.7	453,543	88.0	275,700	96.2	6,521,056	96.0	1,630,264	4.00
March	6,574,701	99.1	493,294	86.4	324,916	102.3	7,392,911	98.2	1,668,829	4.43
1st Quarter	*18,694,642*	*97.0*	*1,437,701*	*86.7*	*906,546*	*98.3*	*21,038,889*	*96.3*	*1,635,994*	*12.86*
April	6,346,707	98.8	454,583	82.2	321,023	104.4	7,122,313	97.7	1,660,213	4.29
May	6,600,376	99.5	454,054	79.5	332,460	104.7	7,386,890	98.2	1,667,470	4.43
June	6,247,302	97.2	452,518	81.8	322,335	104.8	7,022,155	96.4	1,636,866	4.29
2nd Quarter	*19,194,385*	*98.5*	*1,361,155*	*81.2*	*975,818*	*104.6*	*21,531,358*	*97.4*	*1,654,985*	*13.01*
1st 6 months	*37,889,027*	*97.8*	*2,798,856*	*83.9*	*1,882,364*	*101.5*	*42,570,247*	*96.9*	*1,645,545*	*25.87*
July	6,350,047	95.7	453,684	79.6	345,093	96.3	7,148,824	94.5	1,617,381	4.42

Note—The percentages of capacity operated in the first 6 months are calculated on weekly capacities of 1,498,029 net tons open hearth, 128,911 net tons Bessemer and 71,682 net tons electric ingots and steel for castings, total 1,698,622 net tons; based on annual capacities as of Jan. 1, 1942, as follows: Open hearth 78,107,260 net tons, Bessemer 6,721,400 net tons, electric 3,737,510 net tons. Beginning July 1, 1942, the percentages of capacity operated are calculated on weekly capacities of 1,500,714 net tons open hearth, 128,911 net tons Bessemer and 81,049 net tons electric ingots and steel for castings, total 1,710,674 net tons; based on annual capacities as follows: Open hearth 78,247,230 net tons, Bessemer 6,721,400 net tons, Electric 4,225,890 net tons.

PERSONALS . . .

• **A. E. P. Peterka,** manager of the Aircraft Products Division of Lamson & Sessions Co., Cleveland, has been ordered to active duty as a major in the Army Air Forces. Major Peterka is also a member of the board of directors of the Dardelet Threadlock Corp., Detroit, and of the Aircraft Hardware Mfg. Co., Inc., New York. He is a member of the war advisory board of the American Society for Metals, and chairman of the Cleveland chapter. His first job was at the blast furnaces and open hearths of American Steel & Wire Co. where he worked up to acting assistant superintendent before joining the engineering staff of Western Electric Co., Chicago, as development and research engineer. He has been with Lamson & Sessions for the past ten years; he established and built up the organization of his company's Aircraft Products Division.

• **Webb Wilson,** formerly an executive of Smith, Barney & Co., has been appointed as treasurer of the Fairchild Engine & Airplane Corp., according to an announcement by J. Carlton Ward, Jr., president. **William H. Schwebel** was appointed controller and secretary at the same time.

• **Paul H. Shaeffer** has been named assistant general manager of sales for Pittsburgh Metallurgical Co., Inc., Niagara Falls, N. Y. He was formerly with Ohio Ferro Alloys Corp., Canton, Ohio, where he held a similar position.

• **James E. Holmes** has resigned as assistant sales manager of the Tubular Division, Youngstown Sheet & Tube Co., and has become associated with Mr. D. V. Sawhill, Sharon, Pa., president of Mercer Tube & Mfg. Co.

• **Robert H. Morse, Jr.,** who has been branch manager of Fairbanks Morse & Co.'s offices at Cincinnati, Dallas and Boston, has recently been made assistant sales manager of the company.

• **John Elmburg,** formerly manager of the diesel engine department at St. Paul, has been made manager of the Boston branch, filling the vacancy left by Mr. Morse.

• **R. J. Hearn** has been appointed assistant manager of the Boston district office of the Crocker-Wheeler Electric Mfg. Co. Mr. Hearn joined Crocker-Wheeler two and a half years ago as a field engineer. He was formerly employed by Allis-Chalmers Mfg. Co. as sales and service engineer in Milwaukee, Cleveland and Boston.

A. E. R. PETERKA, manager of Aircraft Products Division of Lamson & Sessions Co., who has been called to active duty as an Army Air Force major.

• **Milton Kutz,** who started work as an office boy 45 years ago and now is assistant to the general manager of Du Pont's electrochemicals department, was the guest of honor at a dinner given by his associates on Aug. 4.

• **P. C. Sowersby,** assistant advertising manager for General Electric Co.'s lamp department at Nela Park headquarters, Cleveland, has been transferred to the company's Michigan Division in Detroit. Mr. Sowersby joined General Electric at Schenectady, in 1927, and transferred to the lighting branch of the company at Nela Park in 1938.

• **Paul L. Hexter,** vice-president of Arco Co., has received a commission as a captain in the Army Air Forces. He will be attached to the proving grounds at Eglin Field, Fla., in the section devoted to development of new camouflage techniques and photography. Mr. Hexter is the author of a book on photography, "Make Your Pictures Sing," published in 1940. He joined the Arco organization in 1927.

• **Clarence E. Stevens** has been elected vice-president in charge of plant operations of Norma-Hoffmann Bearings Corp., Stamford, Conn., succeeding Charles B. Malone who resigned July 31. Until April 1, Mr. Stevens was vice-president in charge of manufacturing of Electrolux, Inc., Old Greenwich, Conn.

• **W. N. Wood,** factory manager of the propeller division of Curtiss-Wright Corp., has been appointed plant manager of American Propeller Corp. at Toledo.

• **R. E. Powers** has been named Pacific coast district manager of the manufacturing and repair department, Westinghouse Electric and Mfg. Co. Mr. Powers has served at Chicago as manager of the manufacturing and repair department of the Westinghouse northwestern district for the past four years. He received an electrical engineering degree from Washington State College in 1923 and joined the Westinghouse graduate student course at East Pittsburgh. In 1936 he was made manager of the Eastern Engineering Division, at New York. He held that post until his transfer to Chicago in 1938.

Ralph C. Stuart has been appointed manager of manufacturing to supervise production at five plants of the lamp division of Westinghouse, Bloomfield, N. J. Mr. Stuart was manager of the West Plant of the Canadian Westinghouse Co., at Hamilton, Ontario, until January of this year when he was appointed manager of parts manufacturing for the lamp division. He first joined Westinghouse in 1918 as an assistant foreman at Bloomfield. In 1920 he was transferred to the Canadian Westinghouse Co. to serve as foreman of the West Plant. He was made superintendent of the plant in 1921 and manager in 1930.

G. P. Longabaugh has been appointed by Westinghouse to coordinate and direct manufacturing engineering activities of the company's subcontracting program. Mr. Longabaugh joined the company as an apprentice tool maker and machinist in 1917 and completed the course in 1922. After working as a tool maker, he became an instructor in the apprentice school and then foreman of the training course. From this post he went into time study work.

NON-FERROUS METALS

. . . MARKET ACTIVITIES AND PRICE TRENDS

1942 Congo Tin Output To Reach 20,000 Tons

The Belgian Congo produced 15,000 tons of refined tin in 1941, and the figures for 1942 are expected to reach 20,000 tons. There, as in the case of Bolivia, England and the U. S. are splitting the output on about a 50-50 basis. A Belgian geologist has estimated the total exploitable tonnage of the three main producing areas at between 185,000 and 210,000 tons. Average tin content of the ore is estimated at 70 per cent. Hydroelectric power plants have been installed at various points and a vast system of natural waterways facilitates transportation of ore. The government is also working on a program to develop mechanical transport and is making apparently successful efforts to increase tin production.

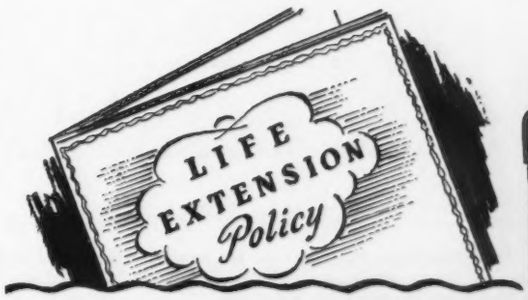
• • • **Another source** of critical non-ferrous metals came into the WPB orbit last week with the board's order that obsolete printing plates must be channeled into war use or their owners may not acquire any new metal. Copper, zinc, tin-antimony lead alloy, and aluminum are sought through the order, which excludes plates having an assured future use.

The Metals Reserve Co. has arranged for Essex Metal Alloy Co., Inc., Newark; National Lead Co., New York; and Metro Smelting Co., Philadelphia, to buy electrotypes, which represent by far the largest tonnage of obsolete plates, at 1¼c. f.o.b. buyers' plants. They will remove the copper sheeting and sell the tin-antimony lead alloy to Metals Reserve through National Lead, its agent. National Lead will remove the tin content and forward it to Metal and Thermit Corp., which will produce electrolytic tin for MRC. The residual antimonial lead will be used for small arms ammunition. Other companies may purchase electrotypes on the same basis and participate in the MRC plan.

Imported silver has been placed under a 35⅜c. price ceiling. Prices had gone as high as 65c. an ounce for Canadian and Mexican silver, due to competitive demand by users. Importation of silver was placed under WPB control on July 21, but until Aug. 5, when the new order was issued, there had been no price regulations for the imported metal.

Mercury conservation order changes (M-78) announced Aug. 5 by WPB, include, as exceptions from restrictions, deliveries to laboratories for certain purposes, manufacture of anti-fouling paint for merchant vessels, and maintenance and repair of industrial control equipment. Fireworks and film equipment were added to the list of prohibited uses.

Other non-ferrous developments: About 40 tons of critical metal a month are going into war production through the tube-for-tube exchange, according to Tin Salvage Institute . . . Twelve million pounds of tin will be saved by the Army, through 1943, according to Lt. Col. J. H. Frye in *Product Engineering* . . . Canadian Copper Refiners, Ltd., is building a copper sulphate plate to operate in conjunction with its refinery . . . The Getchell mine, largest gold producer in Nevada, is completing a tungsten plant with a daily capacity of 300 tons of ore, and is increasing its by-product output of arsenic . . . The Quebec government is said to be considering a million dollar subsidy for a zinc refinery. At present most of the province's production is sent to this country for treatment . . . Western metal mines must either increase wages to compete with defense industries or metal production will go down, according to Herbert B. Maw, governor of Utah, commenting on labor shortages in mining districts . . . An electrolytic copper refinery to handle scrap and residues, which formerly were shipped out of the country for treatment, may be built in England.



HERE'S LIFE EXTENSION FOR CUTTING TOOLS

When you can't buy all the cutting tools you would like you can be thrifty by extending the life of the tools you now have. To do this you need plenty of good coolant. Production men and machine tool builders have found that it is thrifty to use "Gusher Coolant Pumps." They deliver the coolant to the cutting tools in a split second.

There are no packing glands to bind or adjust—No priming. Any rate of flow from a trickle to a gusher is instantly available three shifts a day, every day. Specify Ruthman Gusher for coolant pumps.

The RUTHMAN Machinery Company
CINCINNATI, OHIO, U.S.A.
1821 Reading Road

MACHINE TOOLS

. . . SALES, INQUIRIES AND MARKET NEWS

Industry Faces Period of Fluctuating Steel Shortages

Cleveland

• • • **The severe supply situation** now facing the machine tool industry is declared by some observers to be more or less a natural expectation in the course of transforming a leading industrial nation into a gigantic war machine. It is argued that this transition period of our industry is bound to cause fluctuating "shortages" or blind spots. It is recalled that until recently the machine tool industry had been given most favorable treatment in securing supplies. However, now that so many production lines have been exceeding our most hopeful expectations and chewing up materials that much faster, it is apparent that some curtailment will be in evidence here and there. It is rumored that shell production of a certain size has been curtailed in this area, for example. In any event, the serious predicament which the machine tool industry may find itself in over the next month or so may be one of many pressing factors which may force Washington to deliver the final "death-blow" to small non-essential plants, which have been kept alive thus far even though their inevitable end is in sight.

The tendency of machine tool producers to be less exact in the analysis of the steel that they are trying so hard to get may indicate the feasibility of many steel substitutes in numbers of cases. Many steel inventories in this area are very irregular, ranging from zero for some carbon-steel items to a three months' supply of other types of steel. In some cases the actual quantity involved in the item in which a shortage exists is far smaller than the trouble it may cause to the over-all operations of entire plants.

It is understood that the recent sale of the Strong, Carlisle & Hammond Co. to the Central Illinois Co. of Chicago, headed by C. Russell Feldman, will not affect the company's activities or organizational set-up. It will continue to handle its various items, and, in fact, already was handling the Foster and Libby lines, which had been previously acquired by the Feldman concern.

HENRY FORD AT 79: "I guess I'm getting on in years," Henry Ford remarked on July 30, his 79th birthday. He spent part of the day visiting the little shop in which he built his first car.

Half of Needed Material in Sight

Cincinnati

• • • **While the future of** materials for machine tool production is still without much brightness, current inventories are sufficient to keep present rate of production unchanged. The trade generally feels that present priority allocations will assure at least half of the needed material against future requirements, and they are struggling hard to obtain the additional amount of materials necessary to keep the critical machine tools flowing into use. Present rate of production continues to be well ahead of that of last year, with the trade generally indicating that unless some unforeseen contingency arises, this will be another record year in output. A fair amount of new business continues to flow into district plants.

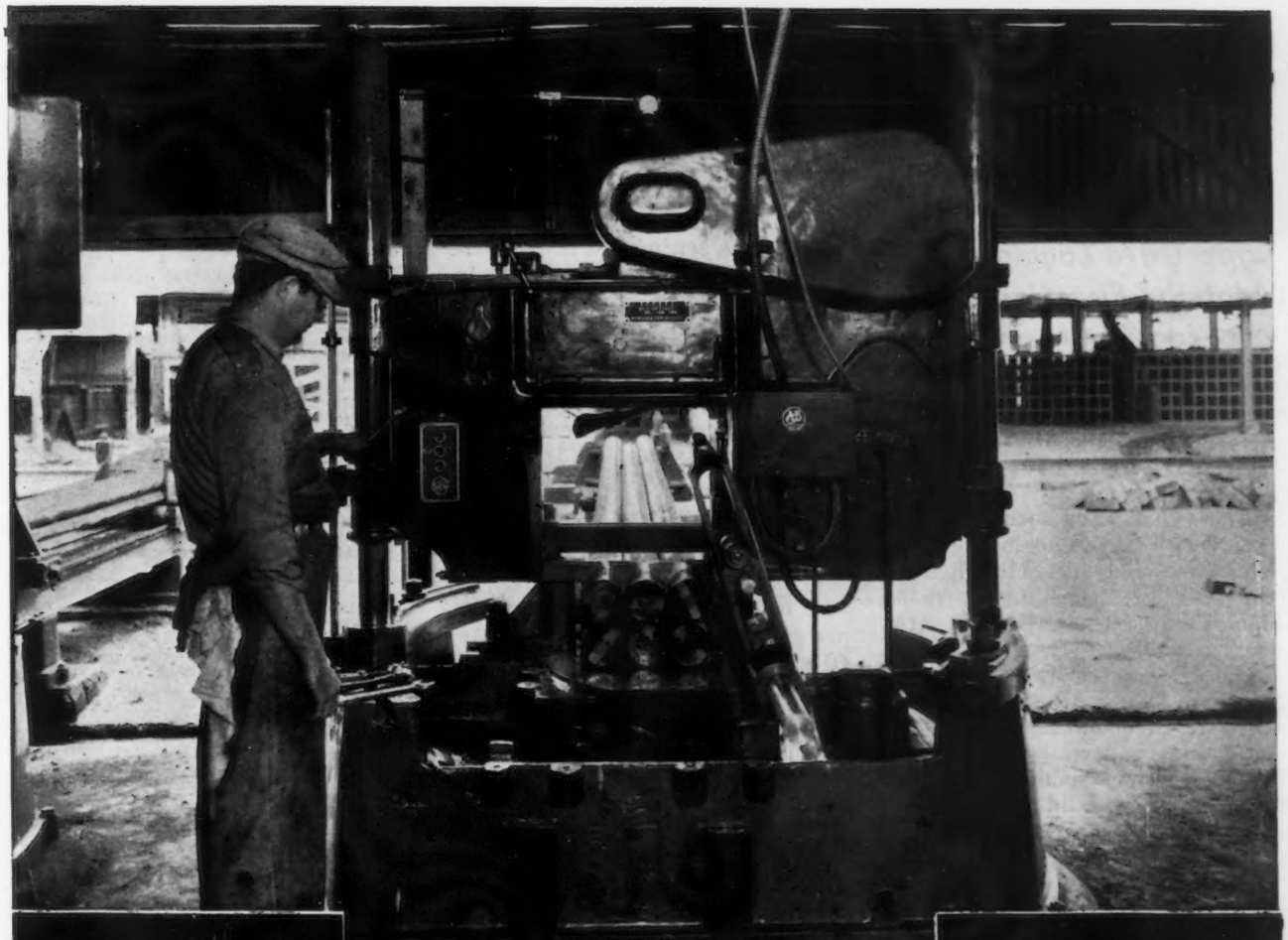
Taxes Cut Van Norman Profits

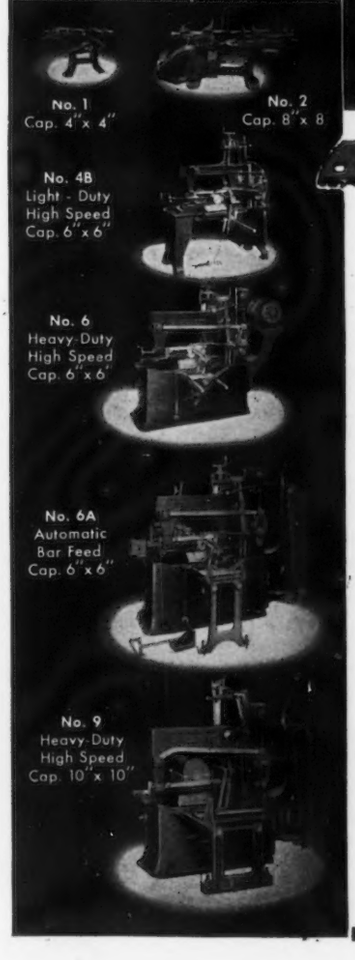
• • • **In the 24 weeks ended** June 20, the Van Norman Machine Tool Co., Springfield, Mass., had a net profit of $319,513, after providing an 80 per cent reserve for income and excess profits taxes, which is equal to $1.33 a share on the then outstanding 240,000 company shares of stock.

The net profit for the like 1941 period was $486,103 or $2.03 a share. The drop in earnings per share can be attributed to greatly increased Federal taxes. While not stating so, the Van Norman management, in its report, intimates that stockholders may possibly have to look for 100 per cent government taxes in the not distant future.

DPC Takes Option On Canonsburg Plant

• • • **The Defense Plant Corp.** has taken a 60-day purchase option on the Canonsburg works property of Carnegie Illinois Steel Corp. It is reported that there are plans to convert the plant to vital war production.





MARVEL SAWS

Cut anything that will go between the jaws

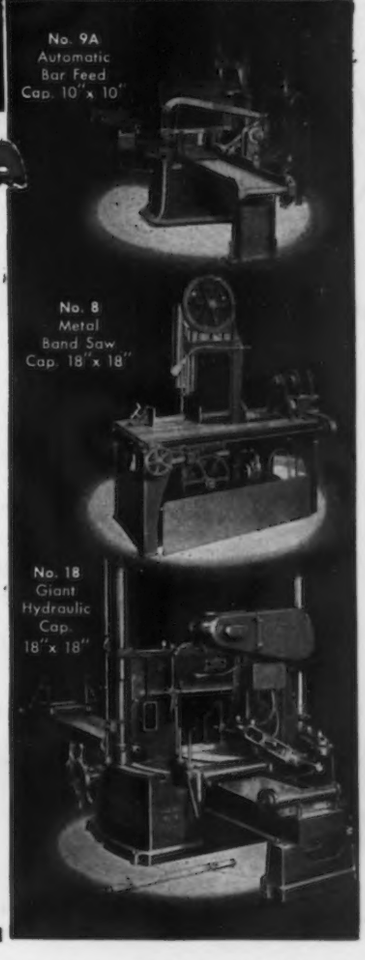
This is one of five No. 18 MARVEL Giant Hydraulic Hack Saws used by a well known Texas tool company to cut-off "multiple bars of alloy steel in round, square, and flat shapes, up to the maximum capacity of the large work-throat (18" x 18")".

These super hack saws are designed for the largest sizes, and toughest steels—up to 18" x 18". After a year's heavy duty service, when asked as to the effectiveness of these saws in solving the cutting-off problems at this plant, the mechanical engineer in charge reported them "very effective."

ARMSTRONG-BLUM MFG. CO.

"The Hack Saw People"

5700 Bloomingdale Ave. Chicago, U. S. A.
Eastern Sales Office: 225 Lafayette St., New York



SCRAP

. . . MARKET ACTIVITIES AND QUOTATION TRENDS

Scrap Drive Lagging; Material Flow Unchanged

• • • **Scrap drives this** week throughout the country were still lagging and some areas report that little change in the flow of material has resulted from the campaign to date. This lines up with opinion of some scrap authorities that many accumulations have been cleaned up in previous drives and that real relief lies in "hard boiled" action to demolish plants and structures that are more valuable as scrap.

There is no evidence that the junkie is being allowed to play his part in some of the drives. Action on condemning, demolishing or otherwise exploiting buildings, trackage, and other steel structures that are of no use industrially but are much more valuable as scrap must come from WPB or MRC. On the farms it is said the farmers are too busy to collect scrap at present and from Washington Edwin C. Barringer, president, Institute of Scrap Iron & Steel, Inc., warns that "Unnecessary sacrifice of historical monuments, and statues is threatened by the lack, in Washington, of technical knowledge of scrap and a misconception of its supply."

•

In order to give dealers a better margin in preparing bundles, the OPA effective Aug. 14, will make the unprepared price for material going into bundles $4.00 a ton below the finished bundle price instead of $2.50 a ton. This, it is said will enable the dealer to be in a better position to compete for this material. Other changes made in amendment No. 7 to revised price schedule No. 4 include:

1—Basic open hearth and blast furnace consumers may pay electric furnace price for electric furnace, acid open hearth, and foundry grades shipped under allocation of the WPB.

2—Allocated tonnages from a railroad operating in a basing point to an off-line consumer are removed from the $1.06 per gross ton limitation on off-line freight charges. This is to protect the railroad from any reduction in realization as result of complying with allocation orders.

See page 110 for more scrap news.

3—Railroads not operating in a basing point are permitted to pass on to the consumer the increase in the foreign line proportion of the through haul to an off-line consumer resulting from a rise in freight rates which became effective after March 14, 1942.

4—Briquetted alloy free turnings have been added as a new grade and are to be priced at the usual $4.00 a ton premium for briquettes but apply only on electric furnace, acid open hearth and foundry sales to consumers.

5—Tube scrap is removed from the list of grades and handled as other unlisted grades.

6—Maximum shipping point price set-up with regard to vessel movement has been slightly relaxed by allowing either the 1940 or the 1941 to be used as a test period.

7—Shipping points in Kansas and Nebraska where the maximum shipping price is $13.00 a gross ton have been made remote.

8—Premiums for alloy content have been extended to all grades.

9—Switching charges to Conshohocken, Pa., which is shown as 36 cents will be made 11 cents on Aug. 14 and charges at Pittsburg, Cal., which are now shown as 32 cents will become 42 cents.

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PITTSBURGH — Scrap interests here examined with interest the latest price revisions issued by the OPA on the scrap schedule. However, there were several disappointments in this connection since the OPA did not establish a sufficient differential to warrant the bundling of turnings. This means that probably more crushed turnings will be shipped than bundled turnings. There was also some surprise in the failure of OPA to clarify the price status of "pit" scrap. As a whole, there has been no major change in the scrap movement to this area during the past week, as incoming supplies apparently are able to do little more than support current operations, indicating that very little further progress has been made toward the establishment of reserve stocks to ease the expected critical conditions that will prevail this coming winter.

•

CHICAGO—Scrap consumers here continue to operate on a hand to mouth basis and are largely dependent upon allocations for supplies. With the winter growing closer and no opportunity to build stocks, mill men are stressing that the scrap situation this winter is going to be more desperate than is generally appreciated. Many do not believe that the nation, including Washington, fully

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Furnished in both the Round and Flattened Strand constructions, in either Standard or Preformed Type.
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There is no guess work when you use "HERCULES" (Red-Strand) Wire Rope. It is designed and built to do specific jobs better . . . safer . . . more economically. If you will tell us how you use wire rope, we shall be glad to suggest the construction and type most suitable for your conditions.
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appreciates the seriousness of the situation. Many steel mill men have expressed the opinion that with present prospects for scrap this winter, the nation's armament plants will not be able to get enough steel to supply an offensive effort of any magnitude.

•

BOSTON—With almost no perceptible increase in collections resulting from the nationally advertised drive, additional auto graveyards closing or about to close, closings of metal working plants for vacations more than offsetting resumptions, additional burdens placed on yardmen by government demands for semi-monthly reports on scrap and a growing scarcity of yard labor, all make for a less favorable scrap picture.

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ST. LOUIS—Further dwindling of scrap receipts here is reported, one reason being that farmers are too busy in the fields to do anything else. Hope is held out for some relief from the advertising campaign, but it has not been felt yet. Mills continue at the high rate of weeks past by drawing on their reserve piles.

•

TORONTO—Movement of scrap from the United States into Ontario has been in heavy volume during the past couple of weeks and record tonnages are moving through the Canals and by railroad to the various steel mills and electric furnaces. In addition to big importations, domestic supply is holding well and incoming scrap is well in excess of current consumption.

•

PHILADELPHIA—While volume holds up fairly well inventories are still being drawn on, except for cast iron grades for which demand seems to be easing off. The district is experiencing less trouble with grading restrictions and the only allocations from dealers this week were four or five of low phosphorus scrap for a steel foundry.

•

CLEVELAND—Railroad allocations of scrap have gone far ahead of deliveries, hence railroads are falling way behind on fulfilling allocations. Since railroad scrap is of the "non-recurring type," inasmuch as the roads cannot secure enough new cars and new rails to permit an increased or even a steady rate of scrapping present equipment, it is obvious that they will continue to be unable to meet allocations at the rate that the WPB is applying them to the railroads.

•

BIRMINGHAM — Under terms of an agreement between Birmingham and WPB, 4060 tons of unused street car rails on Birmingham streets will be removed for use as scrap material. Large tonnages of steel scrap continue to be diverted from the South to other sections where scrap inventories are reported lower.

•

BUFFALO—Leading scrap dealers report the latest national drive to round up more scrap metal has so far shown no results whatever in the Buffalo district. Dissatisfaction with the fixed price schedule and the hardships and problems resulting from its strict observance is growing more outspoken here. Only bright spot this week is an announcement that 27 cemeteries in the district are ready to turn over a large collection of cast iron and wire benches and flower urns that have accumulated over a period of years in storage lots. One cemetery already has reported 40 tons of such metal ready for sale.

•

DETROIT — The enlistment of some 8000 Chevrolet dealers with their 50,000 employees has been urged in the scrap metal drive by William E. Holler, general sales manager of Chevrolet. Pointing out that many dealers were collection agents in the rubber scrap campaign, he stated that the new 6,000,000 tons scrap drive ordered by the WPB would afford these dealers another opportunity to serve the country.

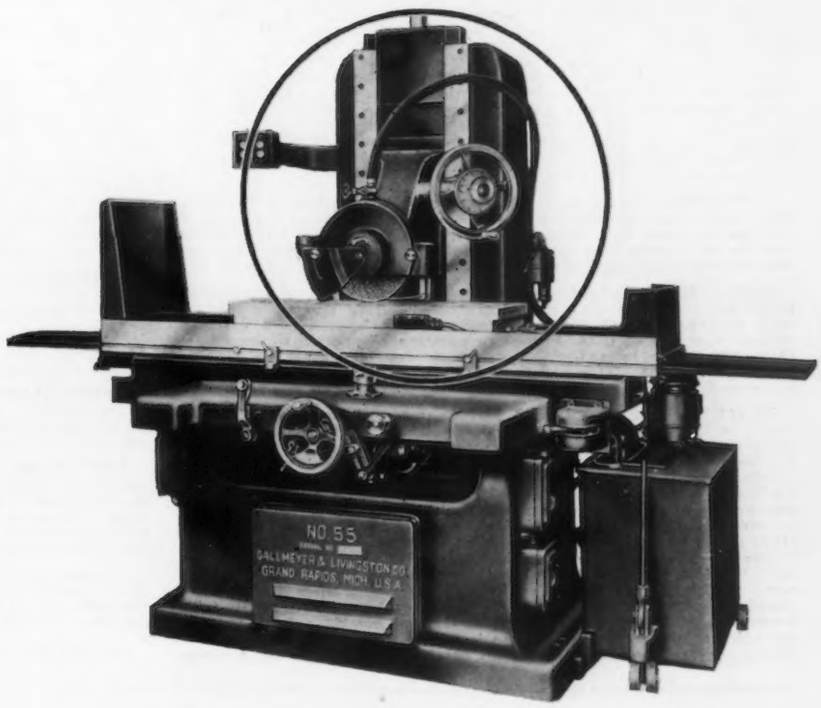
Promotional material and working plans for staging local drives are being provided the dealers by Chevrolet.

•

CINCINNATI—With an allocation of some steel rails from the southern area to the Cincinnati district, the old materials situation is a trifle easier at the present moment. The current scrap drive, so far, has revealed no new sources of old material, and some dealers begin to feel that earlier scrap drives had virtually exhausted most of the waste material that would be brought forward on such efforts.

GRAND RAPIDS

Precision Grinders



THIS hydraulic feed surface grinder combines rigidity with extreme accuracy. Patented vernier control graduated in .0001". Split tenths even on production job. Table Speed to 125ft/min. Table movement 13½x38". Table Size 12x36".

Catalog GL-100 on request.

GALLMEYER & LIVINGSTON CO.
200 STRAIGHT AVE., S.W.
GRAND RAPIDS MICHIGAN

IRON AND STEEL (OTHER THAN RAILROAD) SCRAP

(All Prices Are Per Gross Ton)

	BASIC OPEN HEARTH GRADES (No. 1 Heavy Melting; No. 1 Hydr. Compressed Black Sheets; No. 2 Heavy Melting: Dealers' No. 1 Bundles; Dealers' No. 2 Bundles; No. 1 Busheling)	Machine Shop Turnings	BLAST FURNACE GRADES (Mixed Borings and Turnings; Shovelling Turnings; No. 2 Busheling; Cast Iron Borings)	ELECTRIC FURNACE, ACID OPEN HEARTH AND FOUNDRY GRADES											
				Low Phos.			Heavy Structural and Plate			Cut Auto. Steel Scrap					
				Billet, Bloom, Forge Crops	Bar Crops, Punchings, Plate Scrap and Cast Steel	Tube Scrap	3 ft. and Under	2 ft. and Under	1 ft. and Under	3 ft. and Under	2 ft. and Under	1 ft. and Under and Auto, Springs, and Crankshafts	Alloy free Low Phos. and Sulphur Turnings	Heavy Axle and Forge Turn. First Cut	Electric Furnace Bundles
Pittsburgh, Brackenridge, Butler, Monessen, Midland, Johnstown, Sharon, Canton, Steubenville, Warren, Youngstown, Weirton	$20.00	$16.00	$16.00	$25.00	$22.50	$23.00	$21.00	$21.50	$22.00	$20.00	$20.50	$21.00	$18.00	$19.50	$21.00
Cleveland, Middletown, Cincinnati, Portsmouth	19.50	15.50	15.50	24.50	22.00	22.50	20.50	21.00	21.50	19.50	20.00	20.50	17.50	19.00	20.50
Chicago, Claymont, Coatesville, Conshohocken, Harrisburg, Phoenixville, Sparrows Pt.	18.75	14.75	14.75	23.75	21.25	21.75	19.75	20.25	20.75	18.75	19.25	19.75	16.75	18.25	19.75
Ashland, Ky.	19.50	15.50	15.50	24.50	22.00	22.50	20.50	21.00	21.50	19.50	20.00	20.50	17.50	19.00	20.50
Buffalo, N. Y.	19.25	15.25	15.25	24.25	21.75	22.25	20.25	20.75	21.25	19.25	19.75	20.25	17.25	18.75	20.25
Bethlehem, Pa.; Kokomo, Ind.	18.25	14.25	14.25	23.25	20.75	21.25	19.25	19.75	20.25	18.25	18.75	19.25	16.25	17.75	19.25
Duluth, Minn.	18.00	14.00	14.00	23.00	20.50	21.00	19.00	19.50	20.00	18.00	18.50	19.00	16.00	17.50	19.00
Detroit, Mich.	17.85	13.85	13.85	22.85	20.35	20.85	18.85	19.35	19.85	17.85	18.35	18.85	15.85	17.35	18.85
Toledo, Ohio	.....	13.85	13.85	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
St. Louis, Mo.	17.50	13.50	13.50	22.50	20.00	20.50	18.50	19.00	19.50	17.50	18.00	18.50	15.50	17.00	18.50
Atlanta, Ga.; Birmingham, Ala.; Los Angeles; Pittsburg, Cal.; San Francisco	17.00	13.00	13.00	22.00	19.50	20.00	18.00	18.50	19.00	17.00	17.50	18.00	15.00	16.50	18.00
Minnequa, Colo.	16.50	12.50	12.50	21.50	19.00	19.50	17.50	18.00	18.50	16.50	17.00	17.50	14.50	16.00	17.50
Seattle, Wash.	14.50	10.50	10.50	19.50	17.00	17.50	15.50	16.00	16.50	14.50	15.00	15.50	12.50	14.00	15.50

BUNDLES: Tin can bundles are $4 below dealers' No. 2 bundles; No. 3 bundles are $2 less than No. 1 heavy melting.

SWITCHING CHARGES: Deductions for shipping points within basing points (cents per gross ton) are: Pittsburgh, Brackenridge, 55c.; Midland, Johnstown, Sharon, Youngstown, Warren, Weirton, Cleveland, Toledo, Los Angeles, San Francisco, 42c.; Butler, Monessen, Canton, Steubenville, Cincinnati*, Portsmouth, Ashland, Coatesville, Harrisburg, Phoenixville, Bethlehem, Kokomo, Duluth, St. Louis, 28c.; Buffalo, Claymont, Conshohocken, 36c.; Atlanta, Birmingham, Pittsburg, Cal., 32c.; Middletown, 14c.; Sparrow's Point, 11c.; Chicago, 84c.; Detroit, 53c.; Alabama City, 26c.; Minnequa, 22c.; Seattle, 38c. *At Cincinnati, for basic open hearth grades, cut auto scrap and auto springs and crankshafts, deduct 80c. per ton.

PITTSBURGH basing point includes switching districts of Bessemer, Homestead, Duquesne, Munhall and McKeesport. Cincinnati basing point includes Newport, Ky., switching district. St. Louis includes switching districts of Granite City, East St. Louis, Madison, Ill. San Francisco includes switching districts of S. San Francisco, Niles and Oakland, Cal.

MAXIMUM prices of inferior grades shall continue to bear same differential below corresponding grades as existed during the period Sept. 1, 1940, to Jan. 31, 1941. Superior grades cannot be sold at a premium without approval of OPA. Special preparation charges in excess of the above prices are banned. Whenever any electric furnace or foundry grades are purchased for open hearth or blast furnace use, prices may not exceed the prices above for the corresponding open hearth grades.

MAXIMUM SHIPPING POINT PRICE—Where shipment is by rail or vessel, or by combination of rail and vessel, the scrap is at its shipping point when placed f.o.b. railroad car or f.a.s. vessel. In such cases, the maximum shipping point prices shall be: (a) For shipping points located within a basing point, the price listed in the table above for the scrap at the basing point in which the shipping point is located, minus the lowest established switching charge for scrap within the basing point and (b) for shipping points located outside the basing point, the price in table above at the most favorable basing point minus the lowest transportation charge by rail or water or combination thereof. Dock charge is 75c. a ton*, but 50c. if moved by deck scow or railroad lighter. Shipping by motor vehicle: The scrap is at its shipping point when loaded. For shipping points located within basing points take price listed in table minus applicable switching charge. If located outside a basing point, the price at the most favorable basing point minus lowest established charge for transporting by common carrier. If no established transportation rate exists, the customary costs are deducted. Published dock charges prevail. If unpublished include 75c.* For exceptions see official order.

AT NEW YORK city or Brooklyn, the maximum shipping point price is $15.33 for No. 1 heavy melting, f.o.b. cars, f.a.s. vessel or loaded on truck. Other grades carry differentials similar to those in table. New Jersey prices must be computed on basis of all-rail. At Boston the maximum is $15.05 for No. 1 f.o.b. cars, f.a.s. vessel or loaded on trucks. Shipments from a New England shipping point to a consumer outside New England carry maximum transportation charge of $6.65 per ton.

UNPREPARED SCRAP: For unprepared scrap, maximum prices shall be $2.50 less than the maximum prices for the corresponding grade or grades of prepared scrap. In no case, however, shall electric furnace and foundry grades be used as the "corresponding grade or grades of prepared scrap." Converter may charge $2.50 per ton on consumer-owned unprepared remote scrap (see order).

Maximum price of all scrap in a vehicle is that of the lowest price grade in the shipment. This limitation does not apply to vessel shipments if grades are segregated.

Where scrap is to undergo preparation prior to its arrival at the point of delivery, such scrap is not at its shipping point, as that phrase is defined above, until after preparation has been completed.

CHEMICAL BORINGS: No. 1 (new, clean, containing not more than 1 per cent oil), $1 less than No. 1 heavy melting; No. 2 (new, clean, containing not more than 1.5 per cent oil), $2 less than No. 1 heavy melting. If loaded in box cars add 75c.

UNPREPARED CAST IRON SCRAP—Except for heavy breakable cast, unprepared scrap is given a price ceiling of $2.50 per ton less than the maximum prices for the corresponding grade of prepared cast iron scrap. Where scrap is to undergo preparation prior to arrival at the point of delivery, such scrap is not considered at shipping point until preparation is completed.

Consumers of cast scrap may pay the shipping point price plus established charge for transporting the scrap to their plants. In the case of deliveries by truck, the cast scrap buyer must obtain from the seller a certification, made out to OPA.

*At Memphis 50c.; Great Lakes ports $1; New England $1.25.

RAILROAD SCRAP

	No. 1 RR Heavy Melting	Scrap Rails	Rails for Rerolling	Scrap Rails: 3 ft. and Under	Scrap Rails: 2 ft. and Under	Scrap Rails: 18 In. and Under
Cleveland, Cincinnati, Ashland, Portsmouth, Middletown	$20.50	$21.50	$23.00	$23.50	$23.75	$24.00
Canton, Pittsburgh, Sharon, Steubenville, Wheeling, Youngstown	21.00	22.00	23.50	24.00	24.25	24.50
Chicago, Philadelphia, Sparrows Pt., Wilmington, Birmingham, Los Angeles, San Francisco	19.75	20.75	22.25	22.75	23.00	23.25
Buffalo	18.00	19.00	20.50	21.00	21.25	21.50
Detroit	20.25	21.25	22.75	23.25	23.50	23.75
Duluth	18.85	19.85	21.35	21.85	22.10	22.35
Kansas City, Mo.	19.00	20.00	21.50	22.00	22.25	22.50
Kokomo, Ind.	17.00	18.00	19.50	20.00	20.25	20.50
Seattle	19.25	20.25	21.75	22.25	22.50	22.75
St. Louis	15.50	16.50	18.00	18.50	18.75	19.00
	18.50	19.50	21.00	21.50	21.75	22.00

CAST IRON SCRAP

	Group A	Group B	Group C
No. 1 cupola cast	$18.00	$19.00	$20.00
No. 1 machinery cast, drop broken, 150 lbs. and under	18.00	19.00	20.00
Clean auto cast	18.00	19.00	20.00
Unstripped motor blocks	17.50	18.50	19.50
Stove Plate	17.00	18.00	19.00
Heavy Breakable Cast	16.50	16.50	17.50
Charging box size cast	17.00	18.00	19.00
Misc. Malleable	20.00	21.00	22.00

Group A includes the states of Montana, Idaho, Wyoming, Nevada, Utah, Arizona and New Mexico.

Group B includes the states of North Dakota, South Dakota, Nebraska, Colorado, Kansas, Oklahoma, Texas and Florida.

Group C: States not named in A and B; switch district of Kansas City, Kan., Mo.

. . . Composite Prices

Advances Over Past Week in **Heavy Type**; Declines in *Italics*. (Prices Are F.O.B. Major Basing Points)

Flat Rolled Steel: (Cents Per Lb.)	Aug. 11, 1942	Aug. 4, 1942	July 14, 1942	Aug. 12, 1941
Hot rolled sheets	2.10	2.10	2.10	2.10
Cold rolled sheets	3.05	3.05	3.05	3.05
Galvanized sheets (24 gr.)	3.50	3.50	3.50	3.50
Hot rolled strip	2.10	2.10	2.10	2.10
Cold rolled strip	2.80	2.80	2.80	2.80
Plates	2.10	2.10	2.10	2.10
Stain's c.r strip (No. 302)	28.00	28.00	28.00	28.00
Tine and Terne Plate: (Dollars Per Base Box)				
Tin plate	$5.00	$5.00	$5.00	$5.00
Special coated mfg. ternes	4.30	4.30	4.30	4.30
Bars and Shapes: (Cents Per Lb.)				
Merchant bars	2.15	2.15	2.15	2.15
Cold finished bars	2.65	2.65	2.65	2.65
Alloy bars	2.70	2.70	2.70	2.70
Structural shapes	2.10	2.10	2.10	2.10
Stainless bars (No. 302)	24.00	24.00	24.00	24.00
Wire and Wire Products: (Cents Per Lb.)				
Plain wire	2.60	2.60	2.60	2.60
Wire nails	2.55	2.55	2.55	2.55
Rails: (Dollars Per Gross Ton)				
Heavy rails	$40.00	$40.00	$40.00	$40.00
Light rails	40.00	40.00	40.00	40.00
Semi-Finished Steel: (Dollars Per Gross Ton)				
Rerolling billets	$34.00	$34.00	$34.00	$34.00
Sheet bars	34.00	34.00	34.00	34.00
Slabs	34.00	34.00	34.00	34.00
Forging billets	40.00	40.00	40.00	40.00
Alloy blooms, billets, slabs	54.00	54.00	54.00	54.00
Wire Rods and Skelp: (Cents Per Lb.)				
Wire rods	2.00	2.00	2.00	2.00
Skelp (grvd)	1.90	1.90	1.90	1.90

Pig Iron: (Per Gross Ton)	Aug. 11, 1942	Aug. 4, 1942	July 14, 1942	Aug. 12, 1941
No. 2 fdy., Philadelphia	$25.89	$25.89	$25.89	$25.84
No. 2, Valley furnace	24.00	24.00	24.00	24.00
No. 2, Southern Cin'ti	24.68	24.68	24.68	24.06
No. 2, Birmingham	20.38	20.38	20.38	20.38
No. 2, foundry, Chicago†	24.00	24.00	24.00	24.00
Basic, del'd eastern Pa.	25.39	25.39	25.39	25.34
Basic, Valley furnace	23.50	23.50	23.50	23.50
Malleable, Chicago†	24.00	24.00	24.00	24.00
Malleable, Valley	24.00	24.00	24.00	24.00
L. S. charcoal, Chicago	31.34	31.34	31.34	31.34
Ferromanganese‡	135.00	135.00	135.00	120.00

†The switching charge for delivery to foundries in the Chicago district is 60c. per ton.
‡For carlots at seaboard.

Scrap: (Per Gross Ton)				
Heavy melt'g steel, P'gh.	$20.00	$20.00	$20.00	$20.00
Heavy melt'g steel, Phila.	18.75	18.75	18.75	18.75
Heavy melt'g steel, Ch'go	18.75	18.75	18.75	18.75
No. 1 hy. comp. sheet, Det.	17.85	17.85	17.85	17.85
Low phos. plate, Youngs'n	22.50	22.50	22.50	23.00
No. 1 cast, Pittsburgh	20.00	20.00	20.00	22.00
No. 1 cast, Philadelphia	20.00	20.00	20.00	24.00
No. 1 cast, Ch'go	20.00	20.00	20.00	20.00
Coke, Connellsville: (Per Net Ton at Oven)				
Furnace coke, prompt	$6.00	$6.00	$6.00	$6.125
Foundry coke, prompt	6.875	6.875	6.875	6.875
Non-Ferrous Metals: (Cents per Lb. to Large Buyers)				
Copper, electro., Conn.	12.00	12.00	12.00	12.00
Copper, Lake, New York	12.00	12.00	12.00	12.00
Tin (Straits), New York	52.00	52.00	52.00	53.00
Zinc, East St. Louis	8.25	8.25	8.25	7.25
Lead, St. Louis	6.35	6.35	6.35	5.70
Antimony (Asiatic), N. Y.	16.50	16.50	16.50	16.50

The various basing points for finished and semi-finished steel are listed in the detailed price tables, pages 152 to 160 herein.

. . . Comparison of Prices

	FINISHED STEEL	PIG IRON	SCRAP STEEL
Aug. 11, 1942	2.30467c. a Lb.	$23.61 a Gross Ton	$19.17 a Gross Ton
One week ago	2.30467c. a Lb.	$23.61 a Gross Ton	$19.17 a Gross Ton
One month ago	2.30467c. a Lb.	$23.61 a Gross Ton	$19.17 a Gross Ton
One year ago	2.30467c. a Lb.	$23.61 a Gross Ton	$19.17 a Gross Ton

	FINISHED STEEL HIGH	FINISHED STEEL LOW	PIG IRON HIGH	PIG IRON LOW	SCRAP STEEL HIGH	SCRAP STEEL LOW
1942	2.30467c.,	2.30467c.,	$23.61	$23.61	$19.17	$19.17
1941	2.30467c.,	2.30467c.,	$23.61, Mar. 20	$23.45, Jan. 2	$22.00, Jan. 7	$19.17, Apr. 10
1940	2.30467c., Jan. 2	2.24107c., Apr. 16	23.45, Dec. 23	22.61, Jan. 2	21.83, Dec. 30	16.04, Apr. 9
1939	2.35367c., Jan. 3	2.26689c., May 16	22.61, Sept. 19	20.61, Sept. 12	22.50, Oct. 3	14.08, May 16
1938	2.58414c., Jan. 4	2.27207c., Oct. 18	23.25, June 21	19.61, July 6	15.00, Nov. 22	11.00, June 7
1937	2.58414c., Mar. 9	2.32263c., Jan. 4	23.25, Mar. 9	20.25, Feb. 16	21.92, Mar. 30	12.92, Nov. 10
1936	2.32263c., Dec. 28	2.05200c., Mar. 10	19.74, Nov. 24	18.73, Aug. 11	17.75, Dec. 21	12.67, June 9
1935	2.07642c., Oct. 1	2.06492c., Jan. 8	18.84, Nov. 5	17.83, May 14	13.42, Dec. 10	10.33, Apr. 29
1934	2.15367c., Apr. 24	1.95757c., Jan. 2	17.90, May 1	16.90, Jan. 27	13.00, Mar. 13	9.50, Sept. 25
1933	1.95578c., Oct. 3	1.75836c., May 2	16.90, Dec. 5	13.56, Jan. 3	12.25, Aug. 8	6.75, Jan. 3
1932	1.89196c., July 5	1.83901c., Mar. 1	14.81, Jan. 5	13.56, Dec. 6	8.50, Jan. 12	6.43, July 5
1931	1.99629c., Jan. 13	1.86586c., Dec. 29	15.90, Jan. 6	14.79, Dec. 15	11.33, Jan. 6	8.50, Dec. 29
1930	2.25488c., Jan. 7	1.97319c., Dec. 9	18.21, Jan. 7	15.90, Dec. 16	15.00, Feb. 18	11.25, Dec. 9
1929	2.31773c., May 28	2.26498c., Oct. 29	1871, May 14	18.21, Dec. 17	17.58, Jan. 29	14.08, Dec. 3

Weighted index based on steel bars, beams, tank plates, wire, rails, black pipe, hot and cold-rolled sheets and strip, representing 78 per cent of the United States output. Index recapitulated in Aug. 28, 1941, issue.

Based on averages for basic iron at Valley furnaces and foundry iron at Chicago, Philadelphia, Buffalo, Valley and Southern iron at Cincinnati.

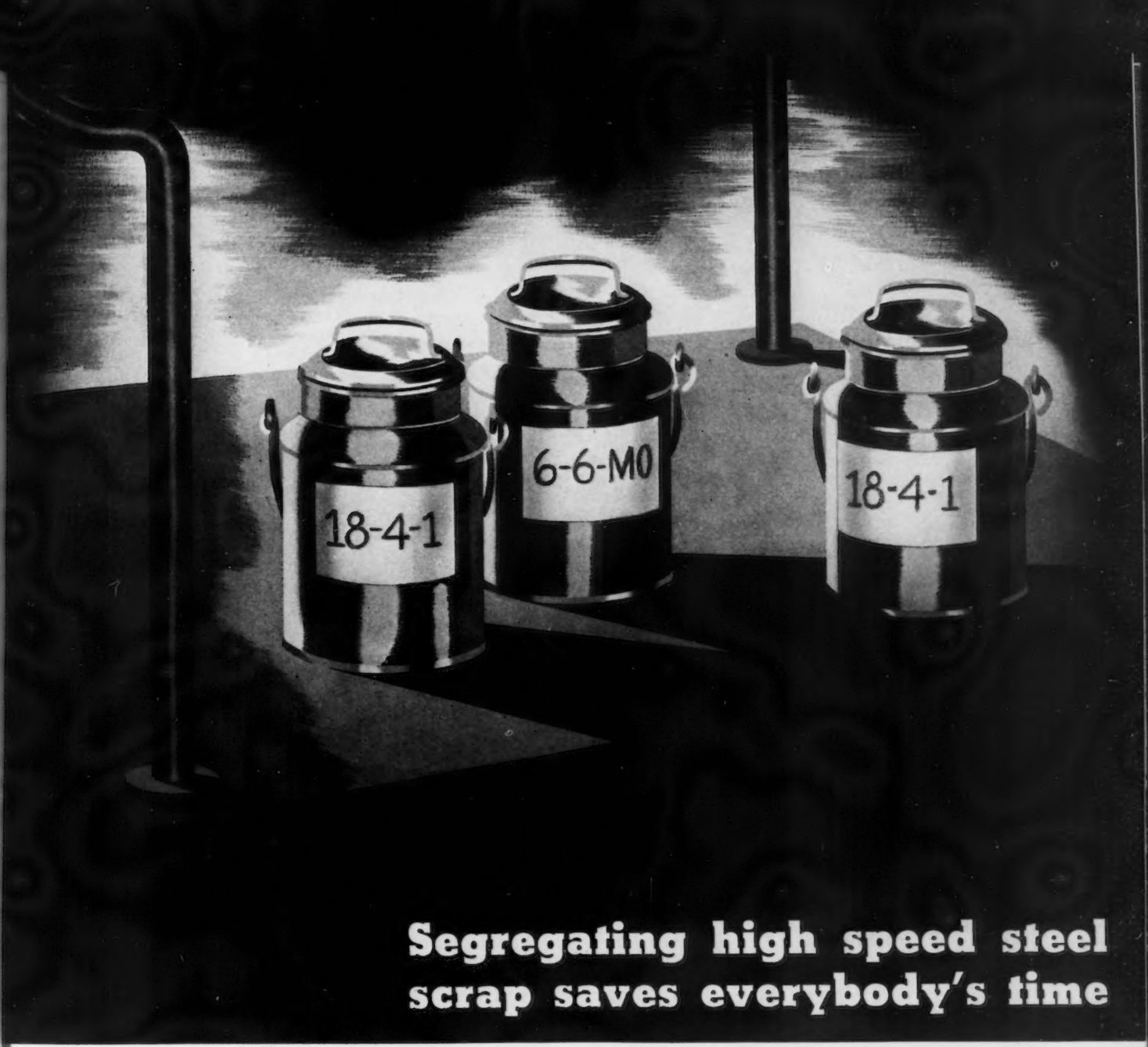
Based on No. 1 heavy melting steel scrap quotations to consumers at Pittsburgh, Philadelphia and Chicago.

Prices of Finished Iron and Steel . . .

Steel prices shown here are f.o.b. basing points, in cents per lb., unless otherwise indicated. On some products either quantity deductions or quantity extras apply. In many cases gage, width, cutting, physical, chemical extras, etc., apply to the base price. Actual realized prices to the mill, therefore, are affected by extras, deductions, and in most cases freight absorbed to meet competition.

Basing Point → / Product ↓	Pittsburgh	Chicago	Gary	Cleveland	Birmingham	Buffalo	Youngstown	Sparrows Point	Granite City	Middletown, Ohio	Gulf Ports, Cars	DELIVERED TO [10] Pacific Ports, Cars	Detroit	New York	Philadelphia
SHEETS															
Hot rolled	2.10¢	2.10¢	2.10¢	2.10¢	2.10¢	2.10¢	2.10¢	2.10¢	2.20¢	2.10¢		2.65¢	2.22¢	2.35¢	2.28¢
Cold rolled[1]	3.05¢	3.05¢	3.05¢	3.05¢		3.05¢	3.05¢		3.15¢	3.05¢		3.70¢	3.17¢	3.41¢	3.39¢
Galvanized (24 ga.)	3.50¢	3.50¢	3.50¢		3.50¢	3.50¢	3.50¢	3.50¢	3.60¢	3.50¢		4.05¢		3.75¢	3.65¢
Enameling (20 ga.)	3.35¢	3.35¢	3.35¢	3.35¢			3.35¢		3.45¢	3.35¢		4.00¢	3.47¢	3.73¢	3.69¢
Long ternes[2]	3.80¢		3.80¢									4.55¢		4.18¢	4.14¢
STRIP															
Hot rolled[3]	2.10¢	2.10¢	2.10¢	2.10¢	2.10¢		2.10¢			2.10¢		2.75¢	2.22¢	2.48¢	
Cold rolled[4]	2.80¢	2.90¢		2.80¢			2.80¢	(Worcester =3.00¢)					2.92¢	3.18¢	
Cooperage stock	2.20¢	2.20¢			2.20¢		2.20¢							2.58¢	
Commodity C-R	2.95¢			2.95¢			2.95¢	(Worcester =3.35¢)					3.07¢	3.33¢	
TIN PLATE															
Standard cokes, base box	$5.00	$5.00	$5.00						$5.10					5.38¢	5.34¢
BLACK PLATE															
29 gage [5]	3.05¢	3.05¢	3.05¢						3.15¢			[13] 4.05¢			3.39¢
TERNES, M'FG.															
Special coated, base box	$4.30	$4.30	$4.30						$4.40						
BARS															
Carbon steel	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢		(Duluth =2.25¢)			2.52¢	2.80¢	2.27¢	2.51¢	2.49¢
Rail steel[6]	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢					2.52¢	2.80¢			
Reinforcing (billet)[7]	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢			2.52¢	[14] 2.55¢	2.27¢	2.40¢	
Reinforcing (rail)[7]	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢				2.52¢	[14] 2.55¢	2.27¢		2.49¢
Cold finished[8]	2.65¢	2.65¢	2.65¢	2.65¢		2.65¢			(Detroit =2.70¢)					3.01¢	2.99¢
Alloy, hot rolled	2.70¢	2.70¢				2.70¢		(Bethlehem, Massilon, Canton =2.70¢					2.82¢		
Alloy, cold drawn	3.35¢	3.35¢	3.35¢	3.35¢		3.35¢							3.47¢		
PLATES								(Coatesville and Claymont =2.10¢)							
Carbon steel	2.10¢	2.10¢	2.10¢	2.10¢	2.10¢		2.10¢	2.10¢	2.25¢([11])		2.47¢	2.65¢	2.33¢	2.30¢	2.155¢
Wrought iron	3.80¢														
Floor plates	3.35¢	3.35¢									3.72¢	4.00¢		3.73¢	3.69¢
Alloy	3.50¢	3.50¢			(Coatesville =3.50¢)						3.97¢	4.15¢		3.71¢	3.60¢
SHAPES															
Structural	2.10¢	2.10¢	2.10¢		2.10¢	2.10¢		(Bethlehem =2.10¢)			2.47¢	2.75¢		2.28¢	2.22¢
SPRING STEEL, C-R															
0.26 to 0.50 Carbon	2.80¢			2.80¢			(Worcester =3.00¢)								
0.51 to 0.75 Carbon	4.30¢			4.30¢			(Worcester =4.50¢)								
0.76 to 1.00 Carbon	6.15¢			6.15¢			(Worcester =6.35¢)								
1.01 to 1.25 Carbon	8.35¢			8.35¢			(Worcester =8.55¢)								
WIRE[9]															
Bright[15]	2.60¢	2.60¢		2.60¢	2.60¢		(Worcester =2.70¢)					3.10¢			2.94¢
Galvanized	add proper size extra and galvanized extra to bright wire base, above.														
Spring (High Carbon)	3.20¢	3.20¢		3.20¢			(Worcester =3.30¢)					3.70¢			3.54¢
PILING															
Steel sheet	2.40¢	2.40¢				2.40¢						2.95¢			2.74¢
IRON BARS[12]															
Wrought single refined	4.40¢														
Wrought double refined	5.40¢														

[1] Mill run sheets are 10c. per 100 lb. less than base: and primes only, 25c. above base. [2] Unassorted 8-lb. coating. [3] Widths up to 12 in. [4] Carbon 0.25 per cent and less. [5] Applies to certain width and length limitations. [6] For merchant trade. [7] Prices for straight length material only, from a producer to a consumer. Functional discount of 25c. per 100 lb. to fabricators. [8] Also shafting. For quantities of 20,000 to 39,999 lb. [9] Carload lot to manufacturing trade. [10] These prices do not apply if the customary means of transportation (rail and water) are not used. [11] Ship plates only. [12] Common iron bars quoted at 2.15c. by Terre Haute, Ind. producer. [13] Boxed. [14] Portland and Seattle price, San Francisco price is 2.50c. [15] This bright wire base price to be used in figuring annealed and bright finish wires, commercial spring wire and galvanized wire.



Segregating high speed steel scrap saves everybody's time

Information supplied by "The Iron Age"

Mixed high speed steel scrap is a source of serious—and needless—wasted time and work for steel makers. The trouble can easily come back on the user in the form of delayed deliveries of high speed steel.

For example, in one mill, tungsten and molybdenum contents in purchased scrap vary so widely that accurate estimation of furnace charges is impossible. A fairly elaborate procedure is necessary to prevent off analysis heats.

The scrap is melted and cast into slugs. The slugs are then analyzed to determine the actual alloy contents, after which they can be used in furnace charges.

As a result, furnace capacity is kept out of production and laboratory time is wasted.

The obvious and most effective remedy is careful segregation of scrap at the source. Even if thorough going segregation systems were difficult to install, which they are not, the end would justify the means.

CLIMAX FURNISHES AUTHORITATIVE ENGINEERING DATA ON MOLYBDENUM APPLICATIONS.
MOLYBDIC OXIDE—BRIQUETTED OR CANNED • FERROMOLYBDENUM • "CALCIUM MOLYBDATE"

Climax Molybdenum Company
500 Fifth Avenue • New York City

MOLY

SEMI-FINISHED STEEL

Billets, Blooms and Slabs

Pittsburgh, Chicago, Gary, Cleveland, Youngstown, Buffalo, Birmingham, Sparrows Point (rerolling only). Prices delivered Detroit are $2.25 higher; f.o.b. Duluth, billets only, $2 higher.

	Per Gross Ton
Rerolling	$34.00
Forging quality	40.00

Shell Steel

	Per Gross Ton
3 in. to 12 in.	$52.00
12 in. to 18 in.	54.00
18 in. and over	56.00

Basic open hearth shell steel, f.o.b. Pittsburgh, Chicago, Buffalo, Gary, Cleveland, Youngstown and Birmingham.

Prices delivered Detroit are $2.25 higher.

Note: The above base prices apply on lots of 1000 tons of a size and section to which are to be added extras for chemical requirements, cutting to length, or quantity.

Sheet Bars

Pittsburgh, Chicago, Cleveland, Youngstown, Buffalo, Canton, Sparrows Point, Md.

	Per Gross Ton
Open hearth or bessemer	$34.00

Skelp

Pittsburgh, Chicago, Youngstown, Coatesville, Pa., Sparrows Point, Md.

	Per Lb.
Grooved, universal and sheared	1.90c.

Wire Rods

(No. 5 to 9/32 in.)

	Per Lb.
Pittsburgh, Chicago, Cleveland	2.00c.
Worcester, Mass.	2.10c.
Birmingham	2.00c.
San Francisco	2.50c.
Galveston	2.25c.

9/32 in. to 47/64 in., 0.15c. a lb. higher. Quantity extras apply.

Alloy Steel Blooms, Billets and Slabs

Pittsburgh, Chicago, Canton, Massillon, Buffalo, or Bethlehem, per gross ton $54.00

TOOL STEEL

(F.o.b. Pittsburgh, Bethlehem, Syracuse)

	Base per Lb.
High speed	67c.
Straight molybdenum	54c.
Tungsten-molybdenum	57½c.
High-carbon-chromium	43c.
Oil hardening	24c.
Special carbon	22c.
Extra carbon	18c.
Regular carbon	14c.

Warehouse prices east of Mississippi are 2c. a lb. higher; west of Mississippi, 3c. higher.

CORROSION AND HEAT-RESISTING STEEL

(Per lb. base price, f.o.b. Pittsburgh)

Chromium-Nickel Alloys

	No. 304	No. 302
Forging billets	21.25c.	20.40c.
Bars	25.00c.	24.00c.
Plates	29.00c.	27.00c.
Structural shapes	25.00c.	24.00c.
Sheets	36.00c.	34.00c.
Hot rolled strip	23.50c.	21.50c.
Cold rolled strip	30.00c.	28.00c.
Drawn wire	25.00c.	24.00c.

Straight-Chromium Alloys

	No. 410	No. 430	No. 442	No. 446
F.Billets	15.725c.	16.15c.	19.125c.	23.375c.
Bars	18.50c.	19.00c.	22.50c.	27.50c.
Plates	21.50c.	22.00c.	25.50c.	30.50c.
Sheets	26.50c.	29.00c.	32.50c.	36.50c.
Hotstrip	17.00c.	17.50c.	24.00c.	35.00c.
Cold st.	22.00c.	22.50c.	32.00c.	52.00c.

Chromium-Nickel Clad Steel (20%)

	No. 304
Plates	18.00c.*
Sheets	19.00c.

*Includes annealing and pickling.

PIG IRON

All prices set in bold face type are maxima established by OPA on June 24, 1941. Other domestic prices (in italics) are delivered quotations per gross ton computed on the basis of the official maxima.

	No. 2 Foundry	Basic	Bessemer	Malleable	Low Phosphorus	Charcoal
Boston††	*$25.53*	*$25.03*	*$26.53*	*$26 03*	.....	.....
Brooklyn	*27.65*	.....	.....	*28.15*	.....	.....
Jersey City	*26.62*	*26.12*	*27 62*	*27.12*	.....	.....
Philadelphia	*25.89*	*25.39*	*26.89*	*26.39*	.....	.....
Bethlehem, Pa.	$25.00	$24.50	$26.00	$25.50	.....	.....
Everett, Mass.††	25.00	24.50	26.00	25.50	.....	.....
Swedeland, Pa.	25.00	24.50	26.00	25.50	.....	.....
Steelton, Pa.	.....	24.50	.....	.....	$29.50	.....
Birdsboro, Pa.	25.00	24.50	26.00	25.50	29.50	.....
Sparrows Point, Md.	25.00	24.50	.....	.....	.....	.....
Erie, Pa.	24.00	23.50	25.00	24.50	.....	.....
Neville Island, Pa.	24.00	23.50	24.50	24.00	.....	.....
Sharpsville, Pa.*	24.00	23.50	24.50	24.00	.....	.....
Buffalo	24.00	23.00	25.00	24.50	29.50	.....
Cincinnati	*24.68*	*24.68*	.....	*25.18*	.....	.....
Canton, Ohio	*25.47*	*24.97*	*25.97*	*25.47*	.....	.....
Mansfield, Ohio	*26.06*	*25.56*	*26.56*	*26.06*	.....	.....
St. Louis	*24.50*	*24.00*	.....	.....	.....	*$31.34*
Chicago	24.00	23.50	24.50	24.00	.....	.....
Granite City, Ill.	24.00	23.50	24.50	24.00	.....	.....
Cleveland	24.00	23.50	24.50	24.00	.....	.....
Hamilton, Ohio	24.00	23.50	.....	24.00	.....	.....
Toledo	24.00	23.50	24.50	24.00	.....	.....
Youngstown*	24.00	23.50	24.50	24.00	.....	.....
Detroit	24.00	23.50	24.50	24.00	.....	.....
Lake Superior fc	.....	.....	.....	.....	.....	$28.00
Lyles, Tenn. fc.†	.....	.....	.....	.....	.....	33.00
St. Paul	*26.76*	.....	*27.26*	*26.76*	.....	.....
Duluth	24.50	.....	25.00	24.50	.....	.....
Birmingham	20.38	19.00	25.00	.....	.....	.....
Los Angeles	*27.25*	.....	.....	.....	.....	.....
San Francisco	*27.25*	.....	.....	.....	.....	.....
Seattle	*27.25*	.....	.....	.....	.....	.....
Provo, Utah	22.00	.....	.....	.....	.....	.....
Montreal	*27.50*	*27.50*	.....	*28.00*	.....	.....
Toronto	*25.50*	*25.50*	.....	*26.00*	.....	.....

GRAY FORGE IRON: Valley or Pittsburgh furnace $23.50

*Pittsburgh Coke & Iron Co. (Sharpsville, Pa. furnace only) and the Struthers Iron and Steel Co., Struthers, Ohio, may charge 50c. a ton in excess of basing point prices for No. 2 foundry, basic, bessemer and malleable.

†Price shown is for low-phosphorous iron; high-phosphorous sells for $28.50 at the furnace.

††Eastern Gas & Fuel Associates, Boston, is permitted to sell pig iron produced by its selling company, Mystic Iron Works, Everett, Mass., at $1 per gross ton above maximum prices.

Switching Charges: Basing point prices are subject to an additional charge for delivery within the switching limits of the respective districts.

Silicon Differentials: Basing point prices are subject to an additional charge not to exceed 50c. a ton for each 0.25 per cent silicon content in excess of base grade (1.75 per cent to 2.25 per cent).

Phosphorous Differential: Basing point prices are subject to a reduction of 38c. per ton for phosphorous content of 0.70 per cent and over.

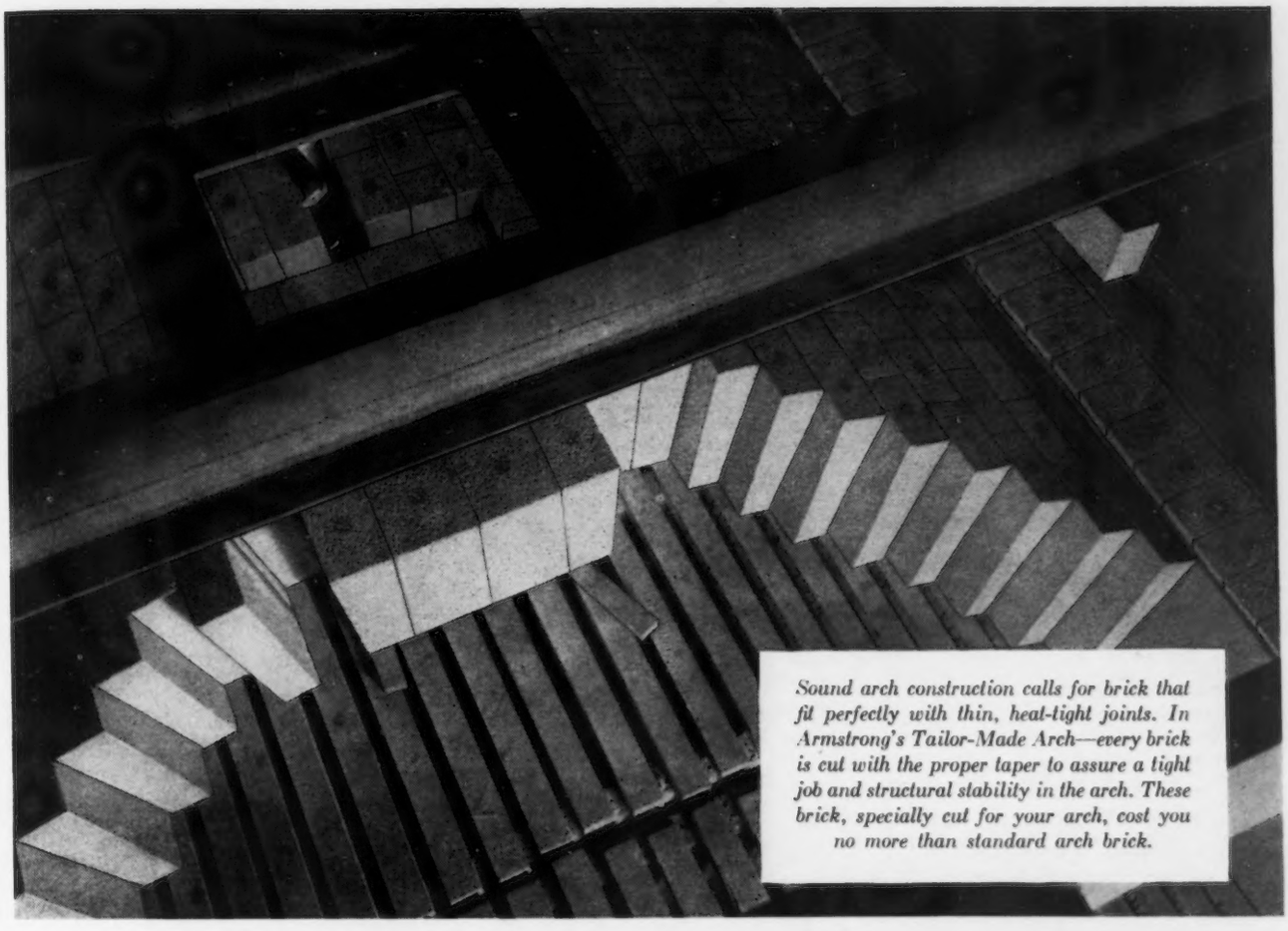
Manganese Differentials: Basing point prices are subject to an additional charge not to exceed 50c. a ton for each 0.50 per cent manganese content in excess of 1.00 per cent.

NATIONAL EMERGENCY STEELS (Hot Rolled)

Extras for Alloy Content

Designation	CHEMICAL COMPOSITION LIMITS, PER CENT									Basic Open-Hearth		Electric Furnace	
	Carbon	Manganese	Phosphorus Max.	Sulphur Max.	Silicon	Nickel	Chromium	Molybdenum	Vanadium	Bars & Bar-Strip	Billets, Blooms, & Slabs	Bars & Bar-Strip	Billets, Blooms, & Slabs
NE 8024	.22/.28	1.00/1.30	.040	.040	.20/.35	.....	.....	.10/.20	.....	.45c	$ 9.00	.95c	$19.00
NE 8124	.22/.28	1.30/1.60	.040	.040	.20/.35	.....	.....	.25/.35	.....	.85	17.00	1.35	27.00
NE 8233	.30/.36	1.30/1.60	.040	.040	.20/.35	.....	.....	.10/.20	.....	.65	13.00	1.15	23.00
NE 8245	.42/.49	1.30/1.60	.040	.040	.20/.35	.....	.....	.10/.20	.....	.65	13.00	1.15	23.00
NE 8339	.35/.42	1.30/1.60	.040	.040	.20/.35	.....	.....	.20/.30	.....	.75	15.00	1.25	25.00
NE 8442	.38/.45	1.30/1.60	.040	.040	.20/.35	.....	.....	.30/.40	.....	.90	18.00	1.40	28.00
NE 8447	.43/.50	1.30/1.60	.040	.040	.20/.35	.....	.....	.30/.40	.....	.90	18.00	1.40	28.00
NE 8547	.43/.50	1.30/1.60	.040	.040	.20/.35	.....	.....	.40/.60	.....	1.25	25.00	1.75	35.00
NE 8620	.18/.23	.70/.95	.040	.040	.20/.35	.40/.60	.40/.60	.15/.25	.....	.75	15.00	1.25	25.00
NE 8630	.27/.33	.70/.95	.040	.040	.20/.35	.40/.60	.40/.60	.15/.25	.....	.75	15.00	1.25	25.00
NE 8724	.22/.28	.70/.95	.040	.040	.20/.35	.40/.60	.40/.60	.20/.30	.....	.80	16.00	1.30	26.00
NE 8739	.35/.42	.75/1.00	.040	.040	.20/.35	.40/.60	.40/.60	.20/.30	.....	.80	16.00	1.30	26.00
NE 8744	.40/.47	.75/1.00	.040	.040	.20/.35	.40/.60	.40/.60	.20/.30	.....	.80	16.00	1.30	26.00
NE 8749	.45/.52	.75/1.00	.040	.040	.20/.35	.40/.60	.40/.60	.20/.30	.....	.80	16.00	1.30	26.00
NE 8817	.15/.20	.70/.95	.040	.040	.20/.35	.40/.60	.40/.60	.30/.40	.....	.90	18.00	1.40	28.00
NE 8949	.45/.52	1.00/1.30	.040	.040	.20/.35	.40/.60	.40/.60	.30/.40	.....	1.20	24.00	1.70	34.00

Note: The extras shown above are in addition to a base price of 2.70c. per 100 lb., on finished products and $54. per gross ton on semi-finished steel major basing points and are in cents per 100 lb. and dollars per gross ton in semi-finished.



Sound arch construction calls for brick that fit perfectly with thin, heat-tight joints. In Armstrong's Tailor-Made Arch—every brick is cut with the proper taper to assure a tight job and structural stability in the arch. These brick, specially cut for your arch, cost you no more than standard arch brick.

THIS FURNACE WILL SOON BE PUSHED FOR PRODUCTION

Armstrong's Insulating Refractories will help it to carry the overload

SOUND construction with the best materials is essential when you're building a furnace that will be pushed for production 24 hours a day. There's no time to spare for repair work now. Armstrong's Insulating Fire Brick are made to stand up under severe service conditions such as prevail in today's drive for production.

All Armstrong's Brick lay up with thin, heat-tight joints because they are accurately machine-sized, they reach the job in good condition, and they can be easily cut and shaped. Once installed they effectively bar heat loss, hold temperatures under accurate control, and keep fuel costs at a minimum.

Five Types of Brick

Five types of efficient Armstrong's Refractories are designed for use at temperature maximums from 1600° F. to 2600° F. All are light in weight and have low heat storage. They heat quicker, cool quicker—speed cycles in intermittent operation. And their high insulating efficiency, physical strength, spalling resistance—plus ample refractoriness—make them ideally suited to service in most furnaces operating in their designated temperature ranges.

Armstrong's engineers will be glad to help you select and install the right insulation for your heat-treating equipment. For complete facts about Armstrong's Brick and this engineering service, write now to Armstrong Cork Company, Insulating Refractories Department, 978 Concord St., Lancaster, Pennsylvania.

ELECTRICAL SHEETS

(Base, f.o.b. Pittsburgh)

	Per Lb.
Field grade	3.20c.
Armature	3.55c.
Electrical	4.05c.
Motor	4.95c.
Dynamo	5.65c.
Transformer 72	6.15c.
Transformer 65	7.15c.
Transformer 58	7.65c.
Transformer 52	8.45c.

F.o.b. Granite City, add 10c. per 100 lb. on field grade to and including dynamo. Pacific ports add 75c. per 100 lb. on all grades.

WIRE PRODUCTS

To the trade, f.o.b. Pittsburgh, Chicago, Cleveland, Birmingham

	Base per Keg
Standard wire nails	$2.55
Coated nails	2.55
Cutnails, carloads	3.85
	Base per 100 Lb.
Annealed fence wire	$3.05
Annealed galvanized fence wire	3.40
	Base Column
Woven wire fence*	67
Fence posts (carloads)	69
Single loop bale ties	59
Galvanized barbed wire†	70
Twisted barbless wire	70

*15½ gage and heavier. †On 80-rod spools in carload quantities.

ROOFING TERNE PLATE

(F.o.b. Pittsburgh, per Package of 112 Sheets)

	20x14 in.	20x28 in.
8-lb. coating I.C.	$6.00	$12.00
15-lb. coating I.C.	7.00	14.00
20-lb. coating I.C.	7.50	15.00
25-lb. coating I.C.	8.00	16.00
30-lb. coating I.C.	8.63	17.25
40-lb. coating I.C.	9.75	19.50

BOLTS, NUTS, RIVETS, SET SCREWS

Bolts and Nuts

(F.o.b. Pittsburgh, Cleveland, Birmingham or Chicago)

Per Cent off List

Machine and Carriage Bolts:

½ in. & smaller x 6 in. & shorter	65½
9/16 & ⅝ in. x 6 in. & shorter	63½
¾ to 1 in. x 6 in. & shorter	61
1⅛ in. and larger, all length	59
All diameters over 6 in. long	59
Lag, all sizes	62
Plow bolts	65

Nuts, Cold Punched or Hot Pressed:

(Hexagon or Square)

½ in. and smaller	62
9/16 to 1 in. inclusive	59
1⅛ to 1½ in. inclusive	57
1⅝ in. and larger	56

On above bolts and nuts, excepting plow bolts, additional allowance of 10 per cent for full container quantities. There is an additional 5 per cent allowance for carload shipments.

Semi-Fin. Hexagon Nuts	U.S.S.	S.A.E.
7/16 in. and smaller	..	64
½ in. and smaller	62	..
⅝ in. through 1 in.	..	60
9/16 to 1 in.	59	..
1⅛ in. through 1½ in.	57	58
1⅝ in. and larger	56	..

In full container lots, 10 per cent additional discount.

Stove bolts, packages, nuts loose 71 and 10

Stove bolts in packages, with nuts attached 71

Stove bolts in bulk 80

On stove bolts freight allowed up to 65c. per 100 lb. based on Cleveland, Chicago, New York on lots of 200 lb. or over.

Large Rivets (½ in. and larger)

Base per 100 lb.

F.o.b. Pittsburgh, Cleveland, Chicago, Birmingham $3.75

Small Rivets (7/16 in. and smaller)

Per Cent Off List

F.o.b. Pittsburgh, Cleveland, Chicago, Birmingham 65 and 5

Cap and Set Screws

Per Cent Off List

Upset full fin. hexagon head cap screws, coarse or fine thread, up to and incl. 1 in. x 6 in.	64
Upset set screws, cup and oval points	71
Milled studs	46
Flat head cap screws, listed sizes	36
Filister head cap, listed sizes	51

Freight allowed up to 65c. per 100 lb. based on Cleveland, Chicago or New York on lots of 200 lb. or over.

PIPE AND TUBING

Welded Pipe

Base Discounts, f.o.b. Pittsburgh District and Lorain, Ohio, Mills

(F.o.b. Pittsburgh only on wrought pipe)

Base Price—$200 per Net Ton

	Black	Galv.
Steel (Butt Weld)		
½ in.	63½	51
¾ in.	66½	55
1 to 3 in.	68½	57½
Wrought Iron (Butt Weld)		
½ in.	24	3½
¾ in.	30	10
1 and 1¼ in.	34	16
1½ in.	38	18½
2 in.	37½	18
Steel (Lap Weld)		
2 in.	61	49½
2½ and 3 in.	64	52½
3½ to 6 in.	66	54½
Wrought Iron (Lap Weld)		
2 in.	30½	12
2½ to 3½ in.	31½	14½
4 in.	33½	18
4½ to 8 in.	32½	17
Steel (Butt, extra strong, plain ends)		
½ in.	61½	50½
¾ in.	65½	54½
1 to 3 in.	67	57
Wrought Iron (Same as Above)		
½ in.	25	6
¾ in.	31	12
1 to 2 in.	38	19½
Steel (Lap, extra strong, plain ends)		
2 in.	59	48½
2½ and 3 in.	63	52½
3½ to 6 in.	66½	56
Wrought Iron (Same as Above)		
2 in.	33½	15½
2½ to 4 in.	39	22½
4½ to 6 in.	37½	21

On butt weld and lap weld steel pipe jobbers are granted a discount of 5%. On less-than-carload shipments prices are determined by adding 25 and 30% and the carload freight rate to the base card.

F.o.b. Gary prices are two points lower discount or $4 a ton higher than Pittsburgh or Lorain on lap weld and one point lower discount, or $2 a ton higher on all butt weld.

WAREHOUSE PRICES

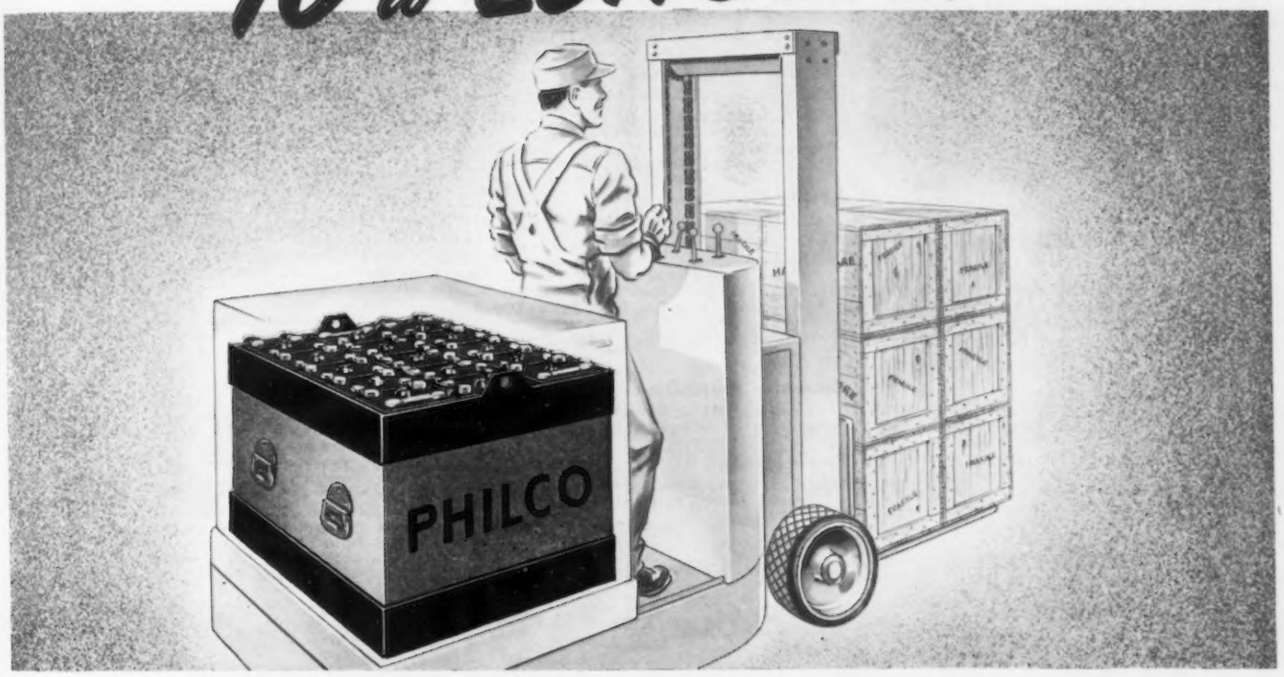
(Delivered Metropolitan areas, per 100 lb. These prices do not necessarily apply for dislocated tonnage shipments when the f.o.b. City prices are used in conformance with OPA Schedule 49)

CITIES	SHEETS			STRIP		Plates (¼ in. and heavier)	Structural Shapes	BARS		ALLOY BARS			
	Hot Rolled (10 ga.)	Cold Rolled	Galv. (24 ga.)	Hot Rolled	Cold Rolled			Hot Rolled	Cold Finished	Hot Rolled 2300	Hot Rolled 3100	Cold Drawn 2300	Cold Drawn 3100
Pittsburgh	$3.35	....	$4.65	$3.60	$3.20	$3.40	$3.40	$3.35	$3.65	$7.45	$5.75	$8.40	$6.75
Chicago	3.25	4.10	4.85[1]	3.60	3.50	3.55	3.55	3.50	3.75	7.35	5.65	8.40	6.75
Cleveland	3.35	4.05	4.62	3.50	3.20	3.40	3.58	3.25	3.75	7.55	5.85	8.40	6.75
Philadelphia	3.55	4.05[5]	4.65	3.51	3.31	3.55	3.55	3.85	4.06	7.31	5.86	8.56	7.16
New York	3.58	4.60[2]	5.00	3.96[6]	3.51	3.76	3.75	3.84	4.09	7.60	5.90	8.84	7.19
Detroit	3.43	4.30	4.84[1]	3.68[6]	3.40	3.60	3.65	3.43	3.80	7.67	5.97	8.70	7.05
Buffalo	3.25	4.30[1]	4.75[4]	3.82	3.52	3.62	3.40	3.35	3.75	7.35	5.65	8.40	6.75
Boston	3.71	4.68	5.11	4.06	3.46	3.85	3.85	3.98	4.13	7.75	6.05	8.88	7.23
Birmingham	3.45[3]	....	4.75[1]	3.70[3]	....	3.55[3]	3.55[3]	3.50[3]	4.48	....	....	....	....
St. Louis	3.39	4.24[2]	4.99[1]	3.74	3.61	3.69	3.69	3.64	4.02	7.72	6.02	8.77	7.12
St. Paul	3.50	4.35	5.00	3.85	3.83	3.80	3.80	3.75	4.34	7.45	6.00	8.84	7.44
Milwaukee	3.38	4.23[2]	4.98[1]	3.73	3.54	3.68	3.68	3.63	3.88	7.58	5.88	8.63	6.98
Baltimore	3.50	....	5.05	4.00	....	3.70	3.70	3.85	4.04	....	....	....	....
Cincinnati	3.42	4.37[2]	4.42[1]	3.67	3.45	3.65	3.68	3.60	4.00	7.69	5.99	8.50	7.10
Norfolk	3.85	....	5.40	4.10	....	4.05	4.05	4.00	4.15	....	....	....	....
Washington	3.60	....	....	4.10	....	3.80	3.80	3.95	4.10	....	....	....	....
Indianapolis	3.45	4.25	5.01[1]	3.75	3.28	3.70	3 70	3.60	3.97	7.67	5.97	8.72	7.07
Omaha	3.85	....	5.52[1]	4.20	....	4.15	4.15	4.10	4.42	....	....	....	....
Memphis	3.85	....	5.25	4.10	....	3.95	3.95	3.90	4.31	....	....	....	....
New Orleans	4.05	....	....	4.30	....	3.90	3.90	4.10	4.60	....	....	....	....
Houston	4.00	....	....	4.30	....	4.05	4.05	3.75	....	....	....	....	....
Los Angeles †	4.95	7.15	5.95	4.90	....	4.90	4.60	4.35	6.60	9.55	8.55	10.55	9.55
San Francisco†	4.55	7.05	6.10	4.50	....	4.65	4.35	3.95	6.80	9.80	8.80	10.80	9.80
Seattle†	4.65[7]	....	5.70[7]	4.25	....	4.75	4.45	4.20	5.75	....	9.00	....	....

BASE QUANTITIES: Hot rolled sheets, cold rolled sheets, hot rolled strip, plates, shapes and hot rolled bars, 400 to 1999 lb., galvanized sheets, 150 to 1499 lb.; cold rolled strip, extras apply on all quantities; cold finished bars, 1500 lb. and over; SAE bars, 1000 lb. and over. Exceptions: [1] 500 to 1499 lb. [2] 400 to 1499 lb. [3] 400 to 3999 lb. [4] 450 to 1499 lb. [5] 1000 to 1999 lb. [6] 0 to 1999 lb. [7] 300 to 10,000 lb. At Philadelphia galvanized sheets, 25 or more bundles; Boston, cold rolled and galvanized sheets, 450 to 3749 lb.; San Francisco, hot rolled sheets, 400 to 39,999 lb., galvanized and cold rolled sheets, 750 to 4999 lb., cold fin. bars, 0-299 lb.; hot rolled alloy bars, 0-4999 lb.; Seattle, cold finished bars, 1000 lb. and over, hot rolled alloy bars, 0-1999 lb.; Memphis, hot rolled sheets, 400 to 1999 lb., galvanized sheets, 150 and over; St. Paul, galvanized and cold rolled sheets, any quantity, hot rolled bars, plates, shapes, hot rolled sheets, 400 to 14,999 lb.; Los Angeles, hot rolled sheets, bars, plates, cold rolled sheets, 300 to 1999 lb.; galvanized sheets, 1 to 6 bundles; cold finished bars, 1 to 99 lb.; SAE bars, 100 lb. Extras for size, quality, etc., apply on above quotations. * 12 gage and heavier, $3.43. †Los Angeles, San Francisco and Seattle prices reflect special provisions of amendment No. 2 to OPA Price Schedule No. 49.

WITH PHILCO XL BATTERIES IN YOUR TRUCKS

EVERY CHARGE LASTS 10% LONGER!



10% GREATER CAPACITY...SUSTAINED HIGH VOLTAGE...LONGER LIFE!

Powered with Philco XL Storage Batteries, your Industrial Trucks can be worked 10% longer between charges! Philco oversize grids and Philco engineering developments give you a battery with 10% greater capacity!

Only in a Philco do you get flint-hard, "K" Process plates for high capacity and sustained voltage . . . Philco Triple Insulation for long productive life . . . rugged Philco construction for minimum maintenance costs. These technical advances have grown out of Philco's fifty years of practical battery experience.

Now, with production facilities tripled, Philco Storage Batteries can be delivered in half the time that is current practice in the industry!

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PHILCO STORAGE BATTERIES

FIFTIETH ANNIVERSARY PHILCO 1892 1942

PHILCO'S NEW TRENTON, N. J., PLANT HAS TRIPLED PRODUCTION FACILITIES OF PHILCO STORAGE BATTERIES

BOILER TUBES

Seamless Steel and Lap Weld Commercial Boiler Tubes and Locomotive Tubes Minimum Wall
(Net base prices per 100 ft., f.o.b. Pittsburgh, in carload lots)

	Seamless Cold Drawn	Lap Weld, Hot Rolled	Lap Weld, Hot Rolled
	$	$	$
2 in. o.d. 13 B.W.G.	15.03	13.04	12.38
2½ in. o.d. 12 B.W.G.	20.21	17.54	16.58
3 in. o.d. 12 B.W.G.	22.48	19.50	18.35
3½ in. o.d. 11 B.W.G.	28.37	24.62	23.15
4 in. o.d. 10 B.W.G.	35.20	30.54	28.66

(Extras for less carload quantities)

40,000 lb. or ft. over	Base
30,000 lb. or ft. to 39,999 lb. or ft.	5%
20,000 lb. or ft. to 29,999 lb. or ft.	10%
10,000 lb. or ft. to 19,999 lb. or ft.	20%
5,000 lb. or ft. to 9,999 lb. or ft.	30%
2,000 lb. or ft. to 4,999 lb. or ft.	45%
Under 2,000 lb. or ft.	65%

CAST IRON WATER PIPE

	Per Net Ton
6-in. and larger, del'd Chicago	$54.80
6-in. and larger, del'd New York	52.20
6-in. and larger, Birmingham	46.00
6-in. and larger f.o.b. cars, San Francisco or Los Angeles	69.40
6-in. and larger f.o.b. cars, Seattle	71.20

Class "A" and gas pipe, $3 extra; 4-in. pipe is $3 a ton above 6-in. Prices shown are for lots of less than 200 tons. For 200 tons or over, 6-in. and larger is $45 at Birmingham and $53.80 delivered Chicago. $59.40 at San Francisco and Los Angeles, and $70.20 at Seattle.

RAILS, TRACK SUPPLIES

(F.o.b. Mill)

Standard rails, heavier than 60 lb., gross ton	$40.00
Angle bars, 100 lb.	2.70
(F.o.b. Basing Points)	*Per Gross Ton*
Light rails (from billets)	$40.00
Light rails (from rail steel)	39.00
	Base per Lb.
Cut spikes	3.00c.
Screw spikes	5.15c.
Tie plates, steel	2.15c.
Tie plates, Pacific Coast	2.30c.
Track bolts	4.75c.
Track bolts, heat treated, to railroads	5.00c.
Track bolts, jobbers discount	63-5

Basing Points, light rails—Pittsburgh, Chicago, Birmingham; spikes and tie plates—Pittsburgh, Chicago, Portsmouth, Ohio, Weirton, W. Va., St. Louis, Kansas City, Minnequa, Colo., Birmingham and Pacific Coast ports; tie plates alone—Steelton, Pa., Buffalo; spikes alone—Youngstown, Lebanon, Pa., Richmond

FERROALLOYS

Ferromanganese

F.o.b. New York, Philadelphia, Baltimore, Mobile or New Orleans, Domestic, 80%, per gross ton (carloads) $135.00

Spiegeleisen

Per Gross Ton Furnace

Domestic, 19 to 21%	$36.00
Domestic, 26 to 28%	49.50

Electric Ferrosilicon

(Per Gross Ton, Delivered Lump Size)

50% (carload lots, bulk)	$74.50
50% (ton lots, packed)	87.00
75% (carload lots, bulk)	135.00
75% (ton lots, packed)	151.00

Silvery Iron

(Per Gross Ton, base 6.00 to 6.50 Si)

F.o.b. Jackson, Ohio $29.50*
Buffalo 30.75*
For each additional 0.50% silicon add $1 a ton. For each 0.50% manganese over 1% add 50c. a ton. Add $1 a ton for 0.75% phosphorus or over.
*Official OPA price established June 24, 1941.

Bessemer Ferrosilicon

Prices are $1 a ton above Silvery Iron quotations of comparable analysis.

Ferrochrome

(Per Lb., Contained Cr, Delivered Carlots, Lump Size, on Contract)

4 to 6 carbon	13.00c.
2 carbon	19.50c.
1 carbon	20.50c.
0.10 carbon	22.50c.
0.06 carbon	23.00c.

Spot prices are ¼c. per lb. of contained chromium higher.

Silico-Manganese

(Per Gross Ton, Delivered, Lump Size, Bulk, on Contract)

3 carbon	$113.00*
2.50 carbon	118.00*
2 carbon	123.00*
1 carbon	133.00*

Other Ferroalloys

Ferrotungsten, per lb. contained W, del'd carload	$2.00
Ferrotungsten, 100 lb. and less	2.25
Ferrovanadium, contract, per lb. contained V, del'd	$2.70 to $2.90†
Ferrocolumbium, per lb. contained Cb, f.o.b. Niagara Falls, N. Y., ton lots	$2.25†
Ferrocarbontitanium, 15-18 Ti, 7-8 C, f.o.b. furnace, carload contract, net ton	$142.50
Ferrocarbontitanium, 17-20 Ti, 3-5 C, f.o.b. furnace, carload contract, net ton	$157.50
Ferrophosphorus, electric or blast furnace materials, carloads, f.o.b. Anniston, Ala., for 18%, with $3 unitage freight, equaled with Rockdale, Tenn., gross ton	$58.50
Ferrophosphorus, electrolytic 23-26%, carlots, f.o.b. Monsanto (Siglo), Tenn., $3 unitage, freight equalized with Nashville, gross ton	$75.00
Ferromolybdenum, per lb., Mo, f.o.b. furnace	95c.
Calcium molybdate, per lb. Mo., f.o.b. furnace	80c.
Molybdenum oxide briquettes 48-52 Mo, per lb. contained Mo, f.o.b. Langeloth, Pa.	80c.
Molybdenum oxide, in cans, per lb. contained Mo, f.o.b. Langeloth, and Washington, Pa.	80c.

*Spot prices are $5 per ton higher.
†Spot prices are 10c. per lb. of contained element higher.

FLUORSPAR

Fire Clay Brick

	Per Net Ton
Domestic washed gravel, 85-5 f.o.b. Kentucky and Illinois mines, all rail	$25.00
Domestic, f.o.b. Ohio River landing barges	25.00
No. 2 lump, 85-5 f.o.b. Kentucky and Illinois mines	25.00
Foreign, 85% calcium fluoride, not over 5% Ci, c.i.f. Atlantic ports, duty paid	Nominal
Domestic No. 1 ground bulk, 95 to 98%, calcium fluoride, not over 2½% silicon, f.o.b. Illinois and Kentucky mines	$34.00
As above, in bags, f.o.b. same mines	36.40

ORES

Lake Superior Ores (51.50% Fe.)

(Delivered Lower Lake Ports)

	Per Gross Ton
Old range, bessemer, 51.50	$4.75
Old range, non-bessemer, 51.50	4.60
Mesaba, bessemer, 51.50	4.60
Mesaba, non-bessemer, 51.50	4.45
High phosphorus, 51.50	4.35

*Foreign Ores**

(C.i.f. Philadelphia or Baltimore, Exclusive of Duty)

	Per Unit
African, 46-48 Mn	70c.-75c.
Indian, 48-50 Mn	75c.
Brazilian, 46-48 Mn	81c. to 83c.
Cuban, 51 Mn	85c.
	Per Short Ton Unit
Tungsten, Chinese, Wolframite, duty paid, delivered	$24 to $26
Tungsten, domestic scheelite, at mine	$24 to $25
Chrome ore, lump, c.i.f. Atlantic Seaboard, per gross ton; South African (low grade)	$28 to $30
Rhodesian, 45	Nom.
Rhodesian, 48	Nom.

*Importations no longer readily available. Prices shown are nominal.

COKE*

Furnace

	Per Net Ton
†Connellsville, prompt	$6.00

Foundry

†Connellsville, prompt .... $6.75 to $7.00

*Maximum by-product coke prices established by OPA became effective Oct. 1, 1941. A complete schedule of the ceiling prices was published in THE IRON AGE, Sept. 25, p. 94B. Maximum beehive furnace coke prices established by OPA, Jan. 26. †F.O.B. oven.

By-product, Chicago	$12.25
By-product, New England	$13.75
By-product, Newark	$12.40 to $12.95
By-product, Philadelphia	$12.38
By-product, Cleveland	$12.30
By-product, Cincinnati	$11.75
By-product, Birmingham	$8.50†
By-product, St. Louis	$12.02
By-product, Buffalo	$12.50

REFRACTORIES

(F.o.b. Works)

Fire Clay Brick

	Per 1000
Super-duty brick, St. Louis	$64.60
First quality, Pennsylvania, Maryland, Kentucky, Missouri and Illinois	51.30
First quality, New Jersey	56.00
Second quality, Pennsylvania, Maryland, Kentucky, Missouri and Illinois	46.55
Second quality, New Jersey	51.00
No. 1, Ohio	43.00
Ground fire clay, net ton	7.60

Silica Brick

Pennsylvania	$51.30
Chicago District	58.90
Birmingham	51.30
Silica cement, net ton (Eastern)	9.00

Chrome Brick

	Per Net Ton
Standard, f.o.b. Baltimore, Plymouth Meeting and Chester	$54.00
Chemically bonded, f.o.b. Baltimore, Plymouth Meeting and Chester Pa.	54.00

Magnesite Brick

Standard f.o.b. Baltimore and Chester	$76.00
Chemically bonded, f.o.b. Baltimore	65.00

Grain Magnesite

Domestic, f.o.b. Baltimore and Chester in sacks (carloads)	$44.00
Domestic, f.o.b. Chewelah, Wash. (in bulk)	22.00

FUEL OIL

No. 6 Bur. Stsd., del'd Chicago	4.75c.
No. 3 distillate del'd Cleveland	6.50c.
No. 4 indus., del'd Cleveland	6.00c.
No. 5 indus., del'd Cleveland	5.25c.
No. 6 indus., del'd Cleveland	5.25c.